Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

APRIL ★ 1952

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

Page 113—Journal Section of The American Society of Heating and Ventilating Engineers

Laboratory is ventilated for safety ..... *page 84*

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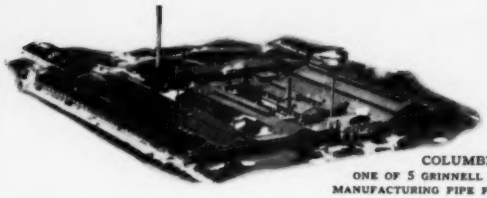
INDUSTRIAL VENTILATION: SEVERAL REPORTS THIS MONTH



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ONE OF 5 GRINNELL PLANTS
MANUFACTURING PIPE FITTINGS

GRINNELL

complete-line manufacturer of high quality PIPE FITTINGS

offers you...

- Complete line of high quality malleable iron and cast iron pipe fittings.
- Large stocks of pipe fittings — mass-produced by skilled workers using modern equipment.
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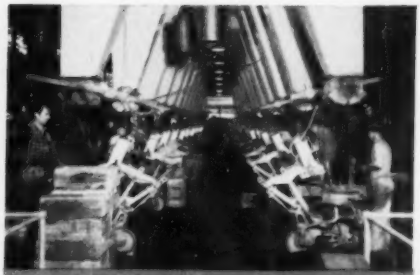
- Coast-to-coast network of branch warehouses and distributors — making available local stocks of Grinnell pipe fittings.

WHENEVER YOU ORDER PIPE FITTINGS,
CALL YOUR NEARBY GRINNELL WAREHOUSE OR DISTRIBUTOR

ONE OF 30 GRINNELL BRANCH WAREHOUSES

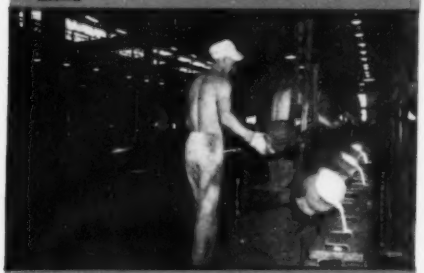
GRINNELL

WHENEVER PIPING IS INVOLVED



Dimensional accuracy assured by finest equipment and modern methods of mechanized molding.

Smooth inside finish obtained by the use of the best core sand and core making equipment.



Superior metal, poured into molds on continuous conveyors, give Grinnell fittings extra strength.

Accurate chamfer and precision threads, produced by modern tapping machines, provide easy starting and tight joints.

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermalier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
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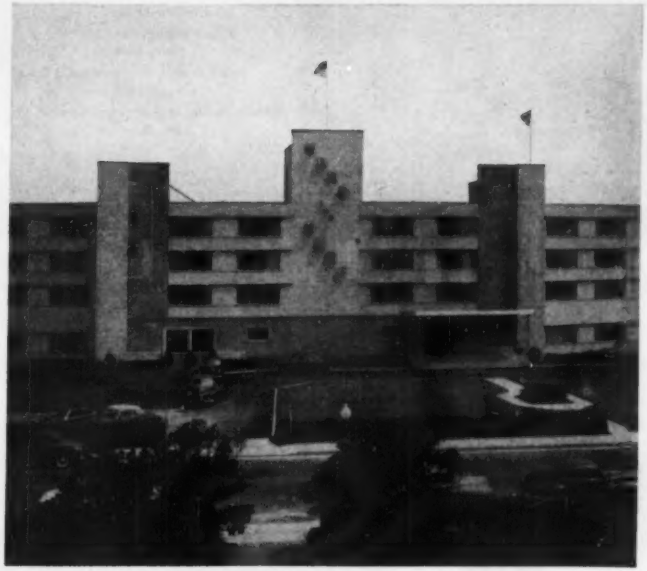


Twin Water Chillers Feature New Sand & Surf Air Conditioning

75 rooms are constantly cooled as usAIRco chillers cool and circulate water to individual room units.

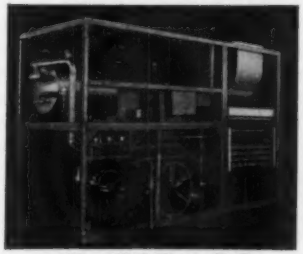
TWO usAIRco Refrigerated Kooleraire, Models RKC, Water Chilling units of 40 and 30 ton capacities provide cold water for summer cooling in Long Branch, New Jersey's newest resort hotel, the Sand & Surf Hotel and Cabana Club. Water, cooled to 40 degrees, is circulated to room conditioners. Both chillers operate during peak loads, but for an economy measure, an automatic control system turns off one chiller on moderately warm days, or when a number of room units are not in use.

usAIRco Water-Chillers incorporate a shell and tube water-chiller and an evaporative condenser, providing a source of cold water for the Modu-aire units in each individual room.

The evaporative condenser combines all the desirable features of the conventional shell and tube condenser, water cooling tower and water pump into a single "packaged" unit. The evaporative condenser saves fully 95% in water costs, as the water not evaporated is recirculated over and over again by means of a pump. Operating costs are negligible . . . pumping costs are low, as compared with a conventional cooling tower installation.

It was the installation of the United States Air Conditioning Corporation's individual room unit system, Modu-aire, that speeded the erection of the building in only six months. Modu-aire eliminated extensive sheet metal work on ducts, saving time and space, enabling installation to be completed in 3 weeks, exactly half the time normally required.

Modu-aire units are also employed to air condition the lobby, while in the hotel's huge card room where all-glass exterior walls are featured, four 7½-ton usAIRco packaged upright conditioners have been used.



usAIRco RKC Water-Chiller

See your nearest usAIRco agent or write to Dept. HP 452

UNITED STATES AIR CONDITIONING CORP.
3300 Como Ave. S.E.
Minneapolis 14, Minn.

usAIRco

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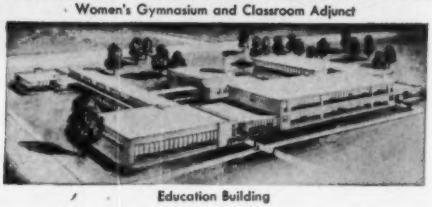
Ft. Worth, Texas

Schrader Plumbing Co.—Mechanical Contractor
Austin, Texas

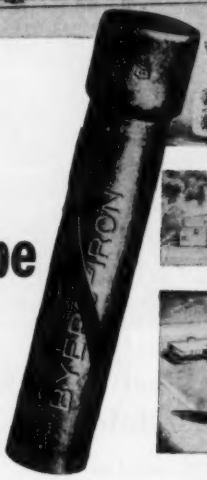
Memorial Stadium

Women's Gymnasium and Classroom Adjunct



Education Building

BYERS Wrought Iron Pipe Safeguards 6 Vital Services at NORTH TEXAS STATE COLLEGE



With an eye to maximum durability and minimum cost-per-year, the designers of these attractive structures at North Texas State College specified genuine wrought iron for all hot and cold water lines, downspouts, gas lines, steam supply and return lines.

In every one of these vital services some degree of corrosion ranging from mild to severe can be expected. And in every one Byers Wrought Iron pipe has established records of continuous, trouble-free service over long periods. Professional recognition of the material's remarkable durability is indicated by its wide-spread use in applications where corrosive attack is expected, and where low-first-cost materials do not provide the desired protection.

If you are contemplating new construction, or extension or replacement of existing piping services, you'll find it profitable to investigate the outstanding performance records of genuine wrought iron. Our bulletin, WROUGHT IRON FOR PIPING SYSTEMS, discusses some of the corrosive conditions found in various services and illustrates a few of the many places where genuine wrought iron pipe has been successfully applied. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

Why Genuine Wrought Iron Lasts

This notch-fracture test specimen illustrates the unique fibrous structure of genuine wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 24, No. 4

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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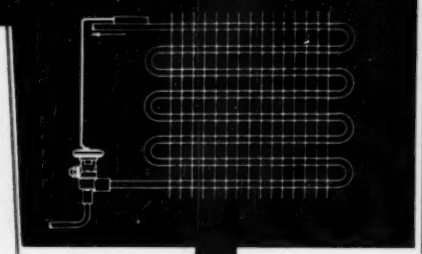
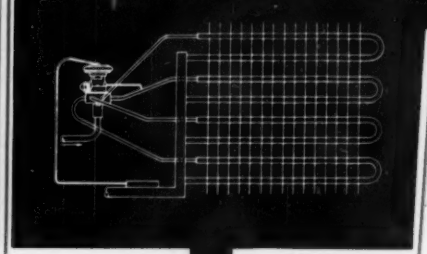
Control your coils more efficiently with these "twin"

ALCO THERMO VALVES





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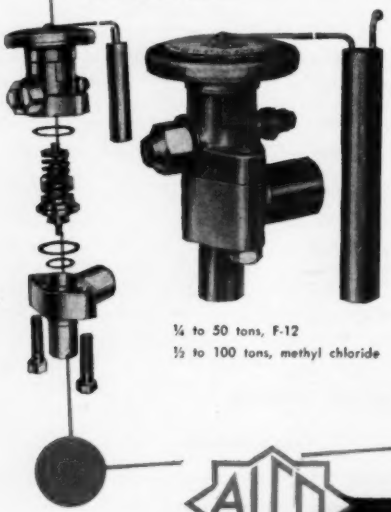
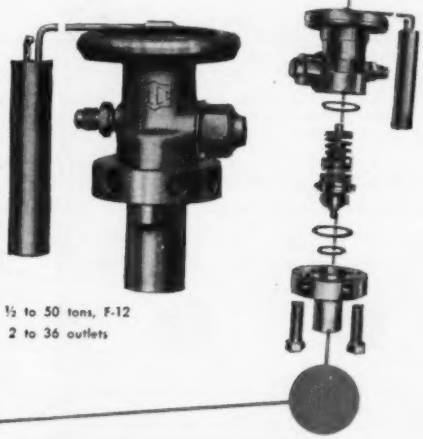
SINGLE OUTLET for single path coils or independent distributing devices. Minimum moving parts for less friction. Automatic hydrogen welded for extra long life. Assures maximum efficiency obtainable with conventional type distribution.



¼ to 50 tons, F-12
½ to 100 tons, methyl chloride

MULTI-OUTLET

MULTI-OUTLET for greatest evaporator efficiency. Same simple "come-apart" construction and advanced design as Single Outlet type. Uniform distribution within the valve itself eliminates hunting, assures control, full utilization of coil capacity.



½ to 50 tons, F-12
2 to 36 outlets

ALCO HAS REFRIGERATION UNDER CONTROL

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A QUARTER-CENTURY OF PIONEERING AND PROGRESS

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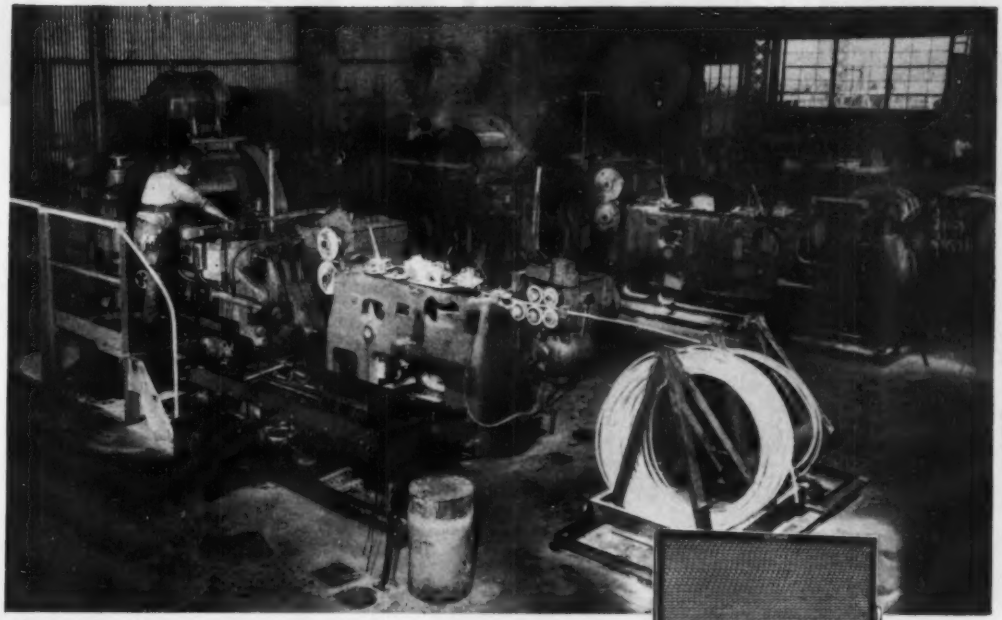


Getting Bolts from the Blue

A large Mid-Western factory* was constantly filled with dense blue smoke generated by the high temperatures and cutting oil from sixty bolt making machines. The complicated and inefficient filtering system used required constant maintenance and allowed heavy oil entrainment into the air ducts.

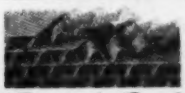
Upon consultation with Farr Field Engineers, this company installed 2" Type 44 and 2" Type 68 FAR-AIR** filters about 8" apart in the air duct.

Results of this installation were the elimination of oil entrainment, a cut of 80% in maintenance and a 50% reduction in required blower power . . . *plus* substantial savings in simplified duct work. Now, bolts are being made in clean air instead of blue smoke, and this company is finding many more uses for FAR-AIR filters in their factories.

If you have an air filtration problem, consult a Farr field engineer for the proper solution. Write for complete information to Farr Company, P.O. Box 10187, Airport Station, Los Angeles 45, California.

*Name furnished on request

FAR-AIR FILTERS



"Better by Farr"

**Trade Mark Reg.

FARR COMPANY *Manufacturing Engineers*

Los Angeles · Chicago · New York

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OVER 2

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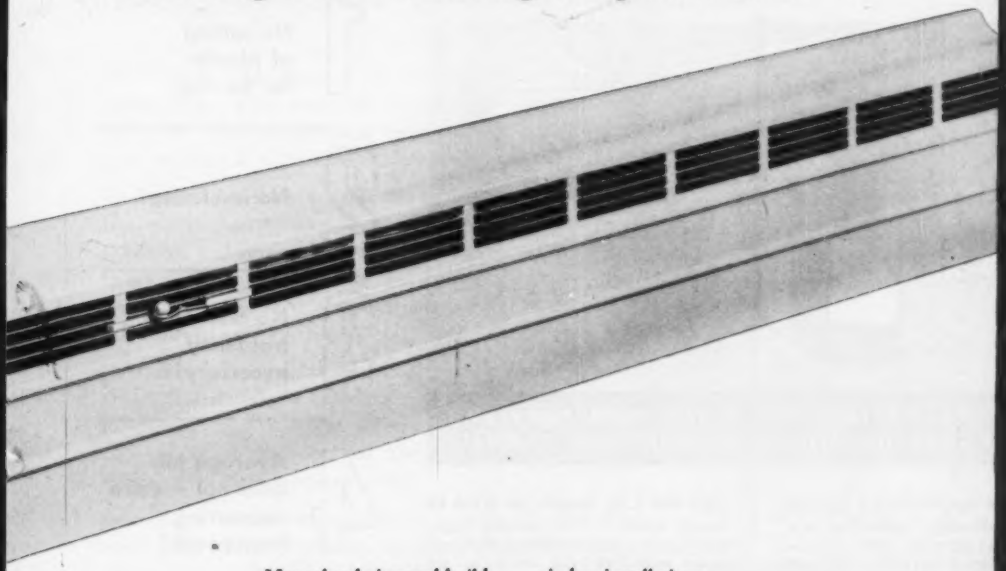
MILES of fedders

Baseboard Radiation

Heating New Chicago Apartment



Men who design and build modern American housing are turning to Fedders Baseboard Radiation for efficient, economical heating.

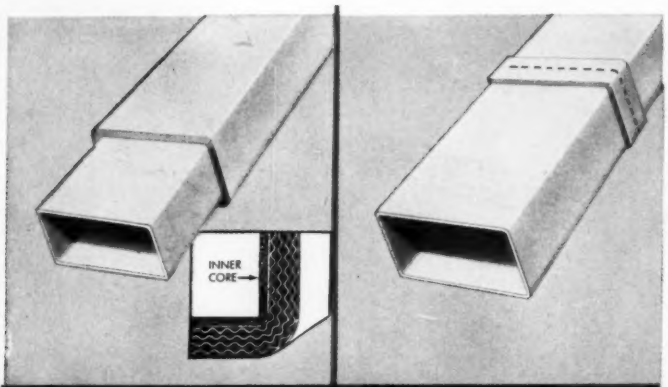
This ultra-smart apartment building located at 4950 Marine Drive is another example of how men of the profession and the industry are providing new comfort, new cleanliness and new decor with Fedders Baseboard Radiation.

Taking the place of ordinary baseboards, Fedders Baseboard Radiation saves space, facilitates furniture arrangement and simplifies picture window installations.

Fedders Baseboard Radiation has specially designed anti-streak covers (patent applied for) which reduce cleaning and maintenance costs.

They are light in weight, easy to stock and install. They give instant response to thermostatic control thus conserving fuel by eliminating necessity to "force the fire" or open windows to cool off. Fedders representatives are located in every major city. You will find their names in your classified telephone directory.

these 5 messy jobs with Carey duct ALL-



CAREYDUCT ELIMINATES EVERY DUCT PROBLEM . . . COMES IN TWO EASY-TO-INSTALL FORMS!

Insulated and Acoustical I & A Careyduct for Air Conditioning Systems! "I & A" Careyduct "soaks up" sound...hushes air noise... absorbs fan rumbles and grumbles . . . makes possible whisper-quiet air conditioning systems in new buildings or old. "I & A" Careyduct handles air velocities up to 2500 feet per minute; permits installation of smaller ducts where space is limited. The 3' sections are designed for rapid, trouble-free installation with ordinary tools!

Single Wall S. W. Careyduct for Warm Air Heating Systems! "SW" Careyduct hushes pops, groans and creaks that "telegraph" through ordinary metal ducts during furnace "on" and "off" periods. Its insulating properties conserve fuel, speed furnace-to-room heat-up time. "SW" Careyduct is also ideal for cold air returns and ventilating conduits. The 3' prefabricated sections are joined by a collar, similar in texture and thickness to the duct itself.

1 *No cutting of plaster for furring!*

2 *No insulating!*

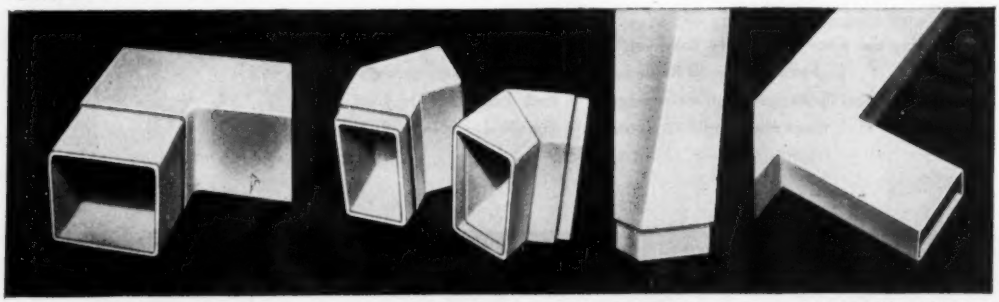
3 *No acoustical treatment necessary!*

4 *Average job does not require supporting framework!*

5 *No decorative treatment needed!*

sizes **Careyduct, I&A and S.W. types, come in a range of sizes from 2½" x 5½" to 17½" x 35½" in width. Also in round sections from 3" to 30" in diameter.**

CAREYDUCT IS AVAILABLE IN THESE SHAPES FOR QUICK ON-THE-JOB



90° Elbows | 45° Elbows | Taper Sections | Side Outlet Take Off

get the boot...
ASBESTOS AIR DUCT

"Non-critical" Careyduct is an improvement over scarce metal ducts – *not a substitute!* It combines insulating and acoustical values in one strong, rigid, all-purpose duct – yet costs no more installed than insulated metal ducts!

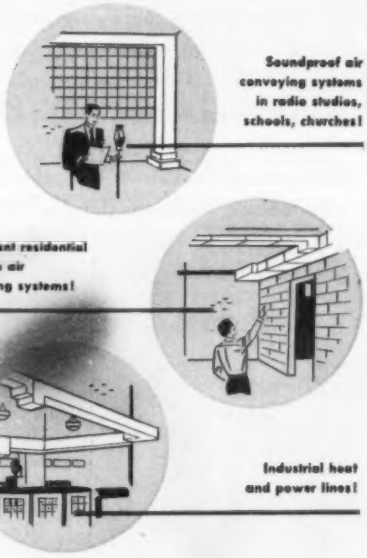
Careyduct takes the headaches out of installation! It's easy to apply because it saws and cuts like wood . . . comes prefabricated and pre-cut to your exact specifications . . . you install it without special tools, and erect it by simple slip-joint construction. You save time and metal . . . cut costs and make money.

Careyduct is the *only* duct material approved by Underwriters' Laboratories*! Made entirely of asbestos from core to cover, it's light in weight, yet strong and rigid . . . low in cost, yet high in efficiency, and takes any kind of decorative treatment, or looks good unfinished.

Consult your Carey representative – or clip and mail the coupon for inside information on America's *fastest-selling, fastest-erecting* air conduit – Careyduct!

*Under Union Jurisdiction, Careyduct is installed by the Sheet Metal Trades.

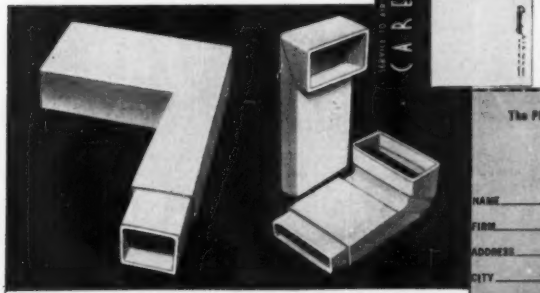
specify Careyduct for


Soundproof air conveying systems in radio studios, schools, churches!
Efficient residential warm air heating systems!
Industrial heat and power lines!

This booklet tells the story!

For quick facts, send for your FREE copy of our illustrated Careyduct Manual.

INSTALLATION!



Increasing Elbow Stackhead

The Philip Carey Manufacturing Company, Lockland, Cincinnati 15, Ohio

Carey

In Canada: The Philip Carey Co., Ltd., 227 Duke Street, Montreal 3, P. Q.

The Philip Carey Mfg. Company, Lockland, Cincinnati 15, Ohio, Department HP-4

Please send me your Careyduct Manual. I understand I will not be obligated in any way.

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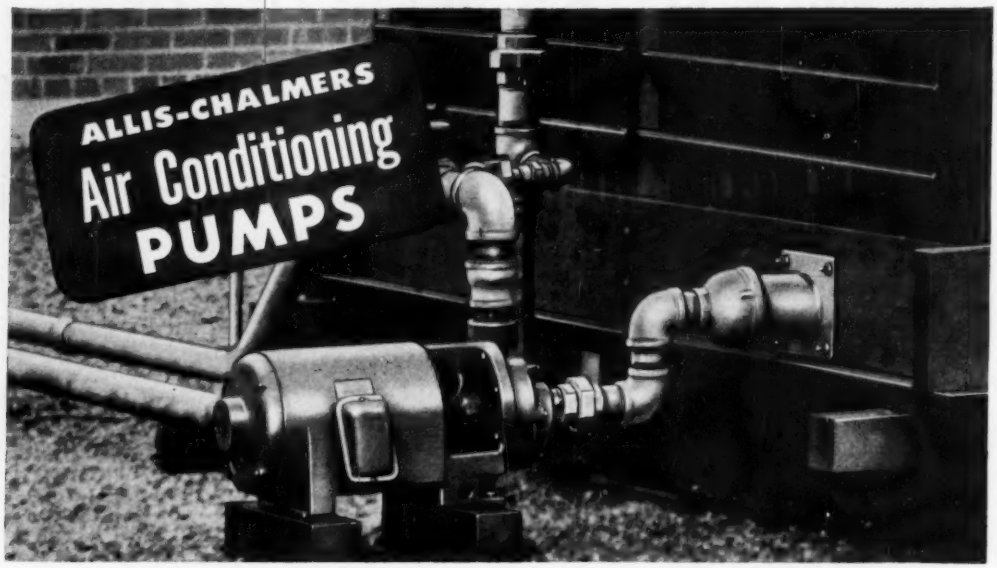
FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



Electrifugal Pump Capacity: 10 to 1600 gpm; heads to 525 ft.

SAVE TIME

Figuring Your Air Conditioning Jobs

BE SURE the job is right! Engineering the circulating system is sometimes a problem. It's here that Allis-Chalmers engineers can save you time and effort.

They'll help you solve problems like these:

- **How big a pipe will I need?**
- **How big a pump will I need?**
- **Where's the best place for the pump?**

You're always sure the job will be right.

As for the installation of the pump itself, that's simple. All it takes to mount these Allis-Chalmers pumps is four mounting bolts, a few pipe fittings, two wires and the quiet, smooth-running pump is installed. No maintenance problems either.

For sound engineering . . . pumps that can't be beat . . . and service that's fast and good, call your nearby Allis-Chalmers authorized dealer or district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3667

Electrifugal is an Allis-Chalmers trademark.

For Small Pumping Jobs, Allis-Chalmers Package Pumps with 5 Big Features

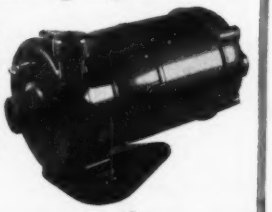
1. **Standard Motor** — These fractional horsepower pumps are built with NEMA standard motors of a well-known brand. Built-in thermal protection provided on single phase units.

2. **Mechanical Seal** is used rather than the usual packing gland. Mechanical seal doesn't leak and requires no regular maintenance.

3. **Closed Impeller** is accurately die cast of special bronze. Impeller has smooth surface and high hydraulic efficiency. It is carefully machined and balanced for quiet operation. Impeller can easily be removed with screwdriver and Allen-type wrench.

4. **Rotatable Casing** — Discharge may be placed in any of four directions.

5. **Easy Installation** — Motor and pump are a single complete unit which is simply bolted in place. No extra parts to buy.



ALLIS-CHALMERS

Lasts longer in corrosive service

This bolted bonnet type Y valve, made to special order in a wide range of alloys, is especially engineered for severe corrosive service. Like all ALOYCO valves, its dependable performance results from: metallurgical research devoted exclusively to corrosive applications . . . foundry and machine shop facilities set up for high alloy valves *only* . . . casting and machining practices dictated by the difficult characteristics of the alloys required for corrosive services.

ALOYCO No. 361 Y Valve for 150 pounds service furnished in a wide range of alloys.

SUCCESS STORIES FROM ALOYCO'S CORROSION CLINIC

THE CORROSIVE: 50% caustic soda and other industrial chemicals.

THE PLACE: S. S. "Marine Chemist", transporting bulk chemicals from Freeport, Texas, to northeastern ports of United States.

THE VALVE: ALOYCO 20 No. 111 gate valves. Valves in the ballast tanks of the ship are alternately submerged in sea water while caustic soda and other chemicals pass through the valves. In some instances, chemicals are in constant motion during transportation. Temperatures of 100°F and better must be maintained to keep caustic soda from solidifying.

THE RESULTS: ALOYCO valves have been successfully combating *interior* corrosion and *external* corrosion as well in this unusual application for two years.

THE BACKGROUND: The *Aloyco Corrosion Clinic* works exclusively in corrosion-resistant alloys. If your problem—whether it be corrosion, contamination, discoloration, temperature extremes, or proper application—can be solved by corrosion-resistant valves, it is one for the Clinic.

ALOYCO concentrates on providing longer valve life in corrosive service. Result: More ALOYCO corrosion-resistant valves are used than any other brand.

ALOYCO is the *largest* manufacturer specializing in high alloy valves. For a dependable solution, put your problem up to *Aloyco's Corrosion Clinic.*

Marine Transport Lines' floating chemical carrier —S. S. "Marine Chemist"—in service for the Dow Chemical Company—transports bulk industrial chemicals.

ALLOY STEEL PRODUCTS CO., INC.
1322 West Elizabeth Avenue, Linden, N. J.

Longer Lasting

ALOYCO VALVES

1st in Corrosive Service

NABISCO

selects SARCO

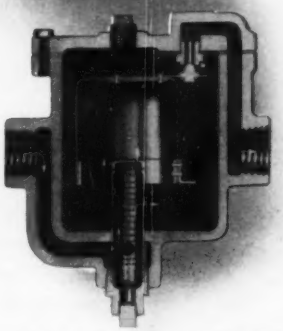
For LARGEST BAKERY on the Pacific Coast

This beautiful, modern bakery just completed by National Biscuit Company in Portland, Oregon, features many innovations. For example, the large tower at left is designed for the storage of raw materials. Each baking unit measures over 600 feet from cutting machine to packing department. The new plant greatly augments NABISCO's service to food merchants and consumers in the expanding Pacific Northwest.

Four types of SARCO STEAM TRAPS are used

Sarco furnished, for the heating system, four different types of steam traps, including a large number of the inverted bucket type as illustrated.

Efficient steam trapping, of course, depends upon the selection of the right type of trap for the particular job. Sarco is the only manufacturer offering a selection of four major types of steam traps, namely: inverted bucket, thermostatic, float-thermostatic and liquid expansion. Write for trap selection chart No. 1600.



SARCO INVERTED BUCKET STEAM TRAP

Since 1936 made with built-in strainer.
All mechanism on cover for easy inspection.

No. 334

SARCO SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

In Motor Courts too!

for Comfort Heating it's Sarcotherm

Tom Sawyer Motor Inn, Albany, N. Y., 100 rooms with 100 baths. Highly rated by A.A.A. . . . Radiant Heating System designed by LeValley-McLeod, Inc. of Schenectady, and installed by A. J. Eckert Co., Albany, N. Y. . . . includes 5 zones—completely Sarcotherm equipped.

Today the luxurious motels which are rapidly displacing the old overnight cabins along our highways from coast to coast, include central heat among the hotel comforts offered.

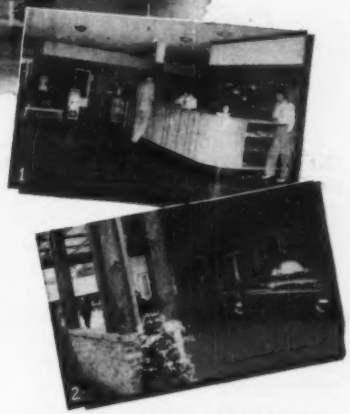
Heating of the one-story, spread-out buildings is usually by forced hot water or radiant means, for which

SARCOTHERM

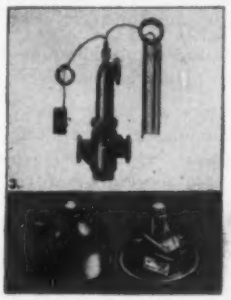
weather-compensated temperature control with continuous circulation is unequalled.

We have pioneered in this field and our experience is at the disposal of architects and engineers who are designing motor courts and wish to include the latest in automatic heating. Here are a few of the Motels recently equipped with Sarcotherm Controls:

Newberry Motel, Russelville, Ky.
Miami Courts Tourist Cabins, Salisbury, Md.
Hotel Sleep, Rahway, N. J.
Garden Motor Lodge, Troy Hills, N. J.
Dutch Maid Motor Lodge No. 2, Woodbridge, N. J.
Smith's Tourist Court, R.F.D., Lynchburg, Va.
Van Winkle Motel, Everett, Washington
Snyder's Court, North Bend, Washington
Leonard Auto Court, Parkland, Washington



1. Main Lobby and Registration Desk at Tom Sawyer Motor Inn.
2. Friends meet at the main entrance in the atmosphere of an exclusive country club.



3. The heart of the Sarcotherm control system for radiant or forced hot water heating is this unique control valve. It is actuated by liquid expansion thermostats, one located outside the building and one in the valve itself. Between them they anticipate changes in heat loss ratio, thus maintaining comfort temperatures under all conditions.
4. The Sarcotherm Comfort Control "Thermoray" is an extremely sensitive thermostat affected by both radiation and convection.

SARCOTHERM CONTROLS, INC.

Empire State Bldg., New York 1, N. Y. • Represented in principal cities

A SARCO PRODUCT

23

TOPS
FOR SINGLE-PHASE JOBS

Motors—Power Performance
Controls—Protective Control

Get top single-phase motor performance and protective motor control with Westinghouse capacitor motors and reliable controls.

CAP motors—(1 to 3 hp) . . . and CAP-2 motors—(5 & 7½ hp) have ample starting torque to master your toughest application. They're constructed with pre-lubricated, factory-sealed bearings . . . die-cast rotors . . . and all-steel frames and brackets. These features are but a few which assure years of stamina with very low maintenance.

Both Life-Linestarter® and Motor Watchman® use the same line of overload relay heaters, reducing replacement heater inventory. Their straight-through wiring and many knockouts make them easy to install for any application.

Working together, these motors and controls spell dependability and economy! Put 'em to work and save!

Learn the many other facts and features of these Westinghouse Motors and Controls. Ask your Westinghouse representative or write for free booklets B-5441 (covering motors), B-4677 (covering Life-Linestarters) or B-5256 (covering NEMA 1-A Motor Watchman), Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21675

MOTOR FEATURES:

Pre-lubricated . . . factory-sealed bearings. Grease sealed in, dirt sealed out. You never need lubricate these bearings.

Die-cast rotors have no windings to burn out or break . . . no brushes to adjust or replace.

Built-in capacitors give high-starting torque for heavy loads with low-line voltage drop. CAP-2 motor has running, as well as starting, capacitor.

All-steel construction assures high-shock resistance . . . makes a smaller, lighter motor.

Tuffernell® insulation of maximum dielectric strength, gives protection against moisture, abrasives and mild chemicals.

CONTROL FEATURES:

Foolproof overload protection provided by snap-action bimetallic disc. Permanently retains calibration.

"De-ion®" arc quenchers . . . extinguish arc in ½ cycle or less. Contacts last longer . . . give trouble-free service.

Quick-make, quick-break over-center toggle mechanism on Motor Watchman . . . reduces arcing time, maintenance costs.

Straight-through wiring has line leads at top . . . load leads at bottom. Ample wiring space and knockouts speed installation.

Motor Watchman safety latch holds switch in "Off" position, protects when servicing.

YOU CAN BE SURE . . . IF IT'S
Westinghouse

SINGLE-PHASE MOTORS and CONTROLS

Capacitor Start—Capacitor Run Motor, 5 and 7½ hp . . . Controlled by the Life-Linestarter.

Capacitor Start—Induction Run Motor, 1 to 3 hp . . . Controlled by "De-ion" NEMA 1-A Motor Watchman.

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

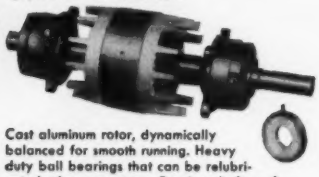
Wagner
CAST IRON FRAME MOTORS
resist corrosion...

Wagner cast iron motors are built for use in chemical plants, oil fields, refineries, steel mills—wherever protection against corrosion is a required feature. They are totally-enclosed and fan-cooled to fully protect their operation against corrosive agents, dirt and dust.

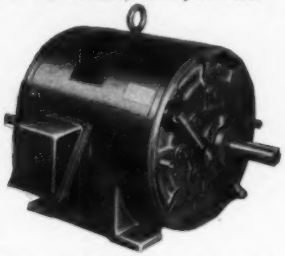
Where additional protection against explosive atmospheres is desired, an explosion-proof design (type JP) is available. Both the standard (type EP) and the explosion-proof types are built in ratings from 2 to 250 hp, with either normal or high torque characteristics. Wagner Bulletin MU-132 gives complete information on these corrosion-resistant motors. Write for your copy today.

features like these give extra protection—

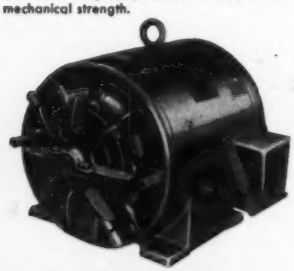
Frame of rugged cast iron. Completely protected laminations. Special varnish treated windings. Cast iron gasket-sealed conduit box.



Cast aluminum rotor, dynamically balanced for smooth running. Heavy duty ball bearings that can be relubricated when necessary. Running shaft seal.



Cast iron endplates, ribbed to add extra mechanical strength.



Externally mounted blower of corrosion-resistant material—malleable iron on type EP, non-sparking bronze on type JP.

Wagner Electric Corporation
EST. WE 1891

WAGNER ELECTRIC CORPORATION
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

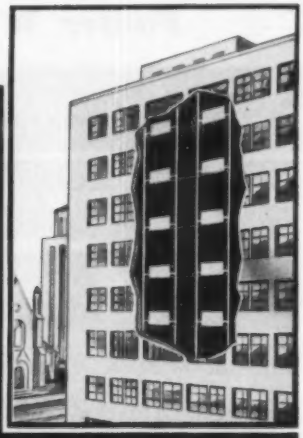
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

M39-4

NOW...a new remote type room air conditioner for multiple installations

THE REMOTAIRE BY AMERICAN-Standard

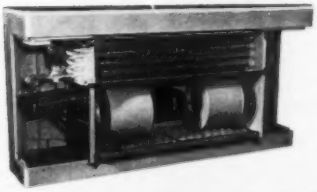


HEATS IN WINTER

COOLS IN SUMMER

PROVIDES CLEAN, FRESH AIR ALL YEAR 'ROUND

Designed for simplified economical installation in both old and new buildings



The new Remotaire is a remote type room conditioner providing all-weather air conditioning for multi-room installations such as hotels, apartments, office buildings, hospitals, residences and motels. It permits individual weather control for each room without affecting adjoining spaces.

The Remotaire uses chilled or heated water supplied through a simple piping system. And since ventilation air is introduced separately to each space, noise and odor transmission between rooms is eliminated.

Ease of installation is a major feature of the Remotaire. Spacious end sections provide plenty of working space; coil is designed for either right or left hand connections; fans and motor are on single mounting plate; and four standard control packages are available.

Be sure of all-weather comfort by specifying and installing efficient Remotaire units. Write for literature. **American Radiator & Standard Sanitary Corporation,** Dept. HP-42, Pittsburgh 30, Pennsylvania.

AMERICAN-Standard

HEATING-COOLING

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · ACME CABINETS · CHURCH SEATS · DETROIT TUBE-ATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

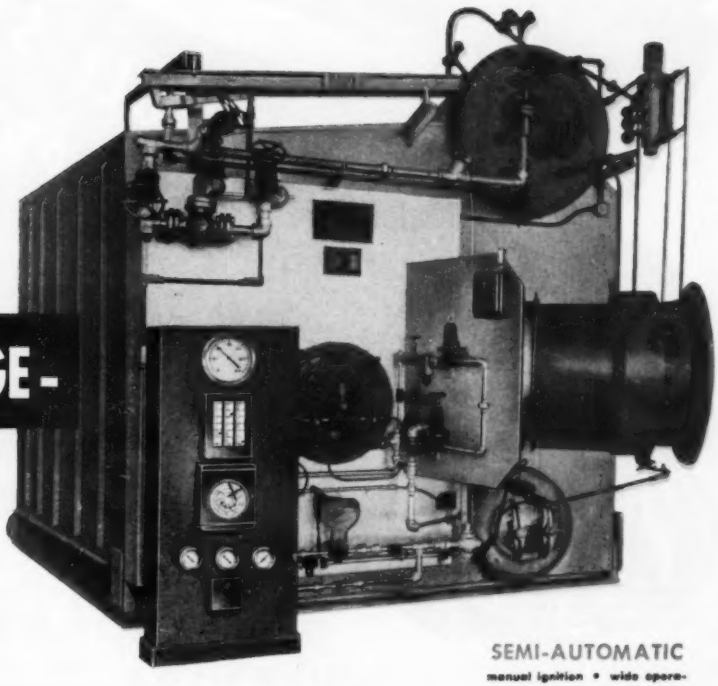
Combined features that distinguish Foster Wheeler package steam generators

WATER TUBE DESIGN	Vertical tubes,...steady water level, closely spaced waterwall tubes on 3½" centers
FACTORY ASSEMBLED STEAM PLANT	Compact, self-contained steam generating units
WIDE RANGE OF CAPACITIES	7,500 to 30,000 lb per hr . . . flexible multi-unit installations for greater capacities
HIGH STEAM TEMPERATURES	Provisions for superheaters in some designs
PORTABILITY	May be transported by common carrier . . . minimizes problems of initial installation and plant relocation
EXPERIENCE	50 years' design, engineering, manufacturing of power plant equipment behind each Foster Wheeler unit
EASILY INSTALLED	Simple foundations . . . few service connections
OUTDOOR INSTALLATION	Rugged, steel encased construction
ACCESSIBILITY	For inspection,...cleaning, maintenance
COMBUSTION CONTROLS	Fully or semi-automatic controls for single or multi-unit installations
CONTROL VALVES	Equipped with 3-valve by-passes
CLEAN HEATING SURFACES	Soot blowers incorporated . . . cleaning without boiler shutdown
HEAT LOSS MINIMIZED	Minimum heat loss—from radiation and air infiltration
RAPID LOAD SWINGS	Large diameter drums and ample furnace heating surface

all for the price

FULLY AUTOMATIC

push-button start • operation at all pressures up to design pressure



# of a PACKAGE-

SEMI-AUTOMATIC

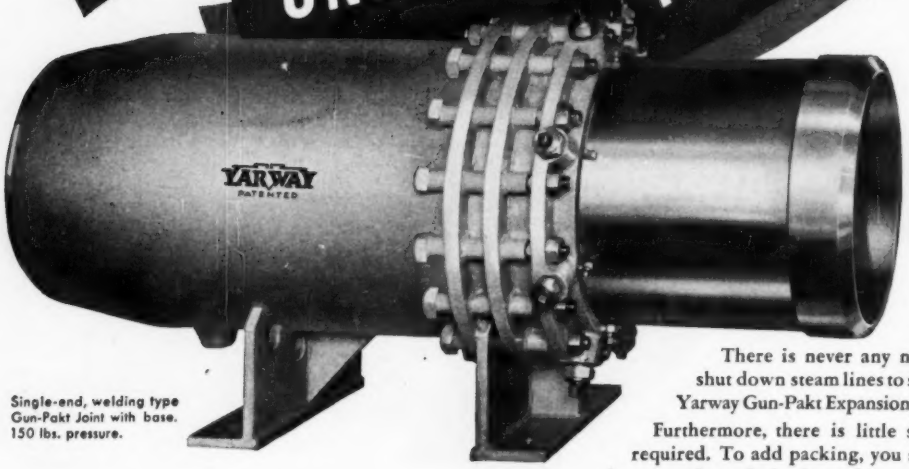
manual ignition • wide operating range • modulating control

When faced with the need for a reliable and economic source of steam for your plant, look for these marks of quality and efficiency—water-tube design, generous proportions, electronic controls—notable attributes of the Foster Wheeler Package Steam Generator available in capacities from 10,000 to 30,000 lb of steam per hr. • Write for CATALOG PG-51-2.

FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

THIS EXPANSION JOINT IS SERVICED UNDER FULL STEAM PRESSURE



Single-end, welding type Gun-Pakt Joint with base. 150 lbs. pressure.

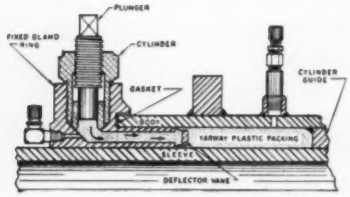
There is never any need to shut down steam lines to service Yarway Gun-Pakt Expansion Joints.

Furthermore, there is little service required. To add packing, you simply insert a plug of plastic packing, turn a wrench, and the job's done! Special Alemite fittings provide for proper lubrication.

Maintenance costs are trifling. One large user reports 65 cents per year per joint. Others claim less than that.

Gun-Pakt Joints are available with single or double-ends, welding or flanged types, in sizes from 2″ to 30″, with traverses from 4″ to 24″, and for pressures to 400 psi.

For the full Gun-Pakt story, write for Yarway Bulletin EJ-1912.



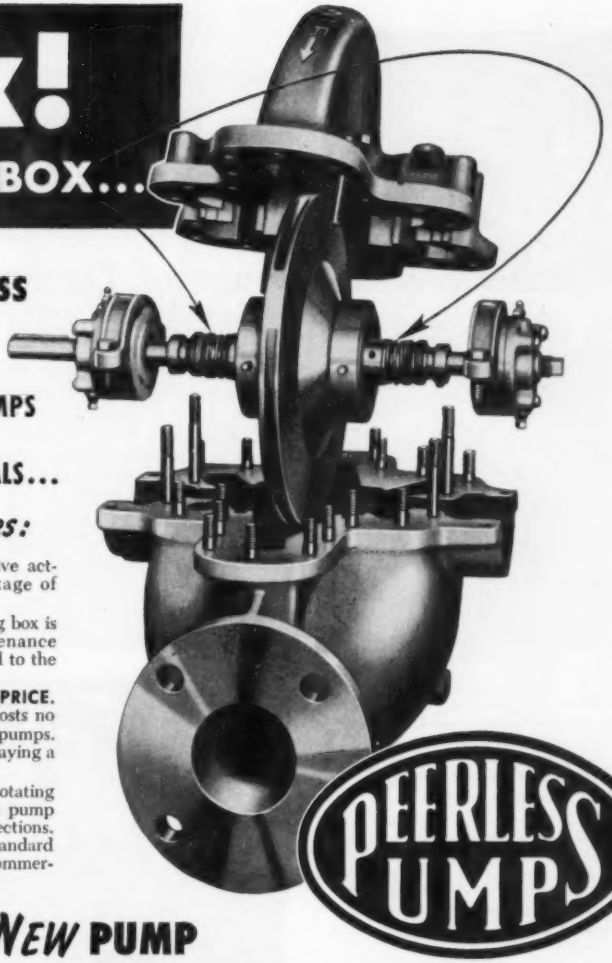
Close-up of cross-section showing detail of Gun-Pakt feature.

YARNALL-WARING COMPANY
107 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY

GUN-PAKT EXPANSION JOINT

LOOK!
NO STUFFING BOX...



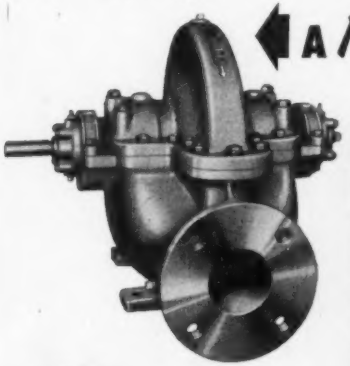
THE NEW PEERLESS TYPE AS

GENERAL PURPOSE PUMPS are designed around MECHANICAL SHAFT SEALS...

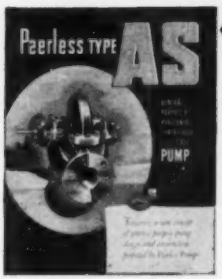
Here are 4 Big Advantages:

1) **NO LEAKAGE.** Simple, positive acting, shaft seals prevent leakage of liquid from pump.
2) **LESS MAINTENANCE.** Stuffing box is completely eliminated; maintenance trouble and expense is reduced to the minimum.
3) ***CUSTOM* PUMP–*STANDARD* PRICE.** The Peerless Type AS pump costs no more than ordinary split-case pumps. You get extra quality without paying a premium.
4) **EASILY SERVICED.** Entire rotating element can be removed from pump without disturbing line connections. Shaft seals and bearings are standard items, easily available from commercial sources.

PEERLESS PUMPS



A *NEW* PUMP
A *NEW* BULLETIN



Write for Bulletin No. B-1350 which completely describes and illustrates the modern design and construction features of Peerless Type AS pumps.

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, California

Please send us a copy of Bulletin No. B-1350 describing Peerless Type AS pumps.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

PEERLESS PUMP fmc

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
Address inquiries to Factories at:
Los Angeles 31, Calif. and Indianapolis 8, Indiana
Offices: New York, Chicago, St. Louis, Atlanta; Dallas, Plainview and Lubbock, Texas; Fresno; Los Angeles; Phoenix; Albuquerque, N. M.; Tulsa.

How Honeywell Customized Temperature Control Helps Bell and Howell Meet Wide Range of Temperature Needs

Specially designed system provides precision industrial control, finest comfort—and saves fuel

These dramatic photographs of Bell and Howell's Chicago plant demonstrate the kind of operation that has made the company one of the world's leading manufacturers of motion picture projectors, cameras and microfilm equipment.

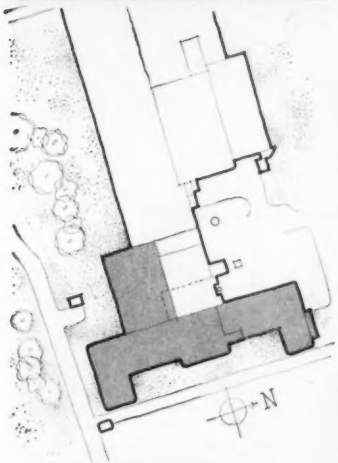
And they serve, too, to demonstrate the great flexibility of Honeywell Customized Temperature Control.

At Bell and Howell, this specially designed system provides factory personnel, office workers and executives with the finest kind of comfort.

But there's more to the story.

Many phases of an operation that produces such precision equipment as cameras, projectors and film demand extremely precise temperatures. These, too, are provided by Honeywell Customized Temperature Control.

And it's this customized control system that enables Bell and Howell to save a great deal on fuel bills each year—by setting back the temperature at night in big factory areas.



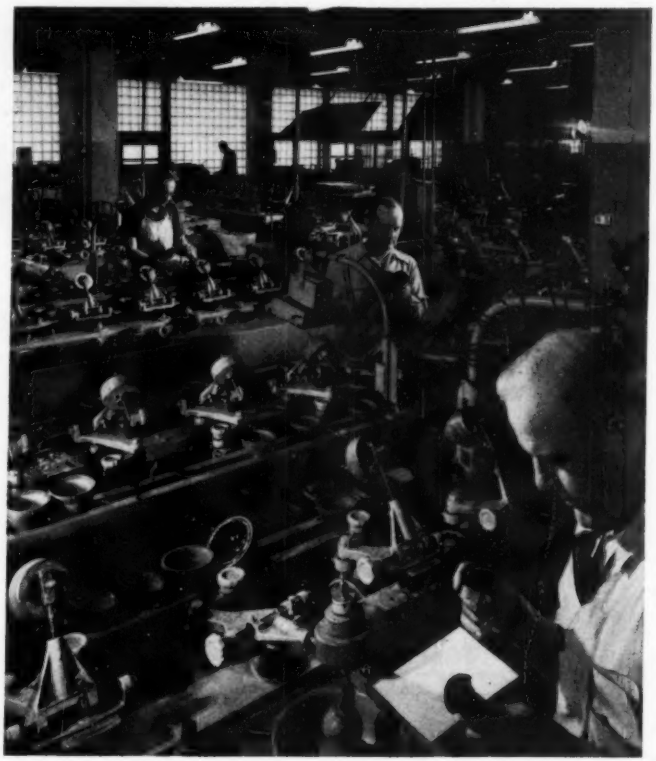
Over a half million square feet of factory, office

The shaded area on the floor plan indicates the air conditioned sections of the plant. Located here are offices, some shipping and stores, some manufacturing. The unshaded portion is mainly manufacturing, partly shipping and storage area.

Architectural firms that designed the main plant were Mundie, Jensen, Bourke and Havens, Chicago, and Bruce A. Gordon and Company, Chicago. Mechanical engineering was by Samuel R. Lewis and Associates, Chicago. Honeywell Customized Temperature Control was installed by L. H. Prentice Co., Chicago. Victor Charn of the Chicago firm, Ragnar Benson Inc., was the architect for the new factory area. Here mechanical engineering was done by Nelson and Nettnin, Inc., Chicago. Honeywell Customized Temperature Control here was installed by O. A. Wendt Co., Chicago.

Lens room temperature an exact 77 degrees

To make sure the pitch used in polishing precision optics retains the proper consistency, Honeywell Customized Temperature Control keeps the temperature exactly 77 degrees in the lens polishing room, right. And in Bell and Howell's film plant in Rochester, N. Y., customized temperature control guards another vital manufacturing process. There, a variety of temperatures—all different—are held at the critical level with a tolerance of only one-half of one degree Centigrade.



In the company's projection salon as many as 50 persons can meet to view business and training films. Smoking is permitted, yet the air is never clouded. Honeywell Customized Temperature Control takes care of that—removing stale air and replenishing it with fresh air for complete comfort.

The final test line for Bell and Howell's famous 16 mm. Filmosound projector is shown above. It is in this area that Honeywell Customized Temperature Control makes possible great fuel savings. For here a master thermostat can be turned down at night to lower temperatures when the area is not in use.

Executive offices like this are perfectly comfortable—no matter how changeable the weather outside. Because in the office area Honeywell Customized Control provides an *individual* thermostat for every room. This thermostat can be adjusted by room occupants to give them the exact temperatures they want. And the ultimate in comfort such a system guarantees is shared by all who work in this part of the plant—secretaries, typists, restaurant personnel and executives. This raises efficiency and helps make Bell and Howell a pleasant, comfortable place to work—in August as well as in January.

For Comfortable, Even Warmth in New or Existing Public Buildings, Specify Honeywell Customized Temperature Control

Whether it's a factory, store, office, school, garage—or any size public building—new or existing—there's a Honeywell Customized Temperature Control System to meet your clients' heating and ventilating problems.

Once equipped with a Honeywell Customized Temperature Control System, they'll have the right kind of controls to keep their employees, customers and tenants comfortable—and they'll save fuel besides.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 91 across the nation. Or mail the coupon today.

"I'll bet no other factory has better control over its heating and air conditioning," says Bell & Howell Superintendent of Maintenance Branson "Buck" Weaver.

"This Honeywell Customized Temperature Control keeps *everyone* comfortable. And it keeps *me* happy because it requires almost no maintenance. Besides that, I enjoy reporting the latest fuel-saving figures."

MINNEAPOLIS-HONEYWELL
Dept. HA-4-71, Minneapolis 8, Minnesota

Gentlemen: I'm interested in learning more about your Customized Temperature Control Systems for public buildings.

Name_____

Firm Name_____

Address_____

City_____ Zone____ State_____

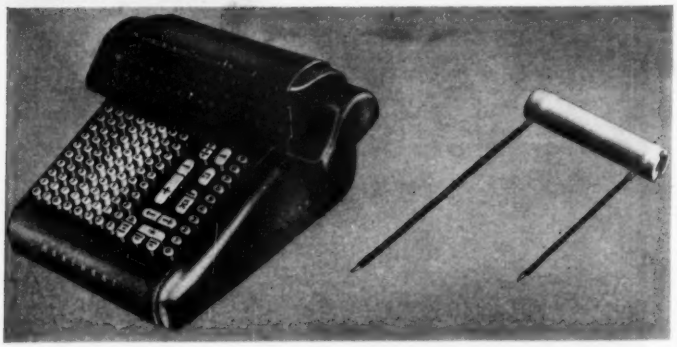
MINNEAPOLIS
Honeywell

First in Controls

Marchant Calculating Machine Company

"They make no mistake in figuring resistor costs"

says L. F. Church, L. F. Church Company, San Francisco, representative for Ward Leonard Electric Company



It's *cost in terms of performance* that counts with the makers of Marchant calculators.

A lot of arithmetic would be delayed if resistors failed to work in these push-button multiplication calculators. That's why Marchant insists upon quality resistors.

How do you *tell* a quality resistor?

It's true that most resistors look alike. But there the similarity ends, because in the *important* things that really count, resistors are miles apart!

Take the tube. Companies like Marchant depend on that high-density, non-porous, high-dielectric strength, perfectly cylindrical Ward Leonard ceramic core, with smooth surface and straight ends.

They also know the terminals are made of the right alloy to permit proper expansion, and that they're securely, rigidly, clamped to the core.

They know the wire is drawn especially, to Ward Leonard specifications, for their type of resistor, that it is capable of withstanding great overloads, has uniformly low coefficient of resistivity.

They also know the coating provides a complete hermetic seal, highly resistant to thermal shock and to high humidity, acids, alkalies, electrolysis.

You can be sure of quality by buying your resistors from the *one* manufacturer who manufactures, not just assembles, all the components that go into resistors. Play it safe and sound—insist upon VITROHM resistors.

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Atlanta 5, Ga.
C. B. Rogers and Associates, 1000 Peachtree St., N. E.
Baltimore 18, Maryland
Durling Electric Co., 2322 No. Charles St.
Charlotte 1, No. Carolina
James L. Highsmith & Co., P. O. Box 1011
Chicago 4, Illinois
Ward Leonard Electric Co., 53 West Jackson Blvd.
Cincinnati 2, Ohio
Sheldon Storer and Assoc., Trans. Bldg., 307 E. 4th St.
Cleveland 14, Ohio
The Ambos-Jones Co., 1085 The Arcade
Corpus Christi, Texas
Bronco-Krochy Co., Inc., 126 North Staples St., P. O. Box 463
Denver 2, Colorado . . . Mark G. Mueller, 1644 Blake St.
Detroit 21, Michigan
Jesse W. Eakins Co., 16575 James Couzens Highway
Hartford 6, Conn.
Ward Leonard Electric Co., 37 Webster St.
Houston 1, Texas
Bronco-Krochy Co., Inc., 4411 Navigation Blvd. P. O. Box 1724
Kansas City 2, Mo. . . .Maury E. Battis Co., 406 W. 34th St.
Knoxville, Tenn.
John G. Pattyjohn, 1243 North Broadway, P. O. Box 395
Los Angeles 13, Calif.
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E. E. Torkell, 198 So. Main St., P. O. Box 4020
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Newark 2, N. J. Marvin H. Kirkaby, 437 Oliver Ave., S.
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New Orleans 13, La.
Electron Engineering Co., 1038 Constance St.
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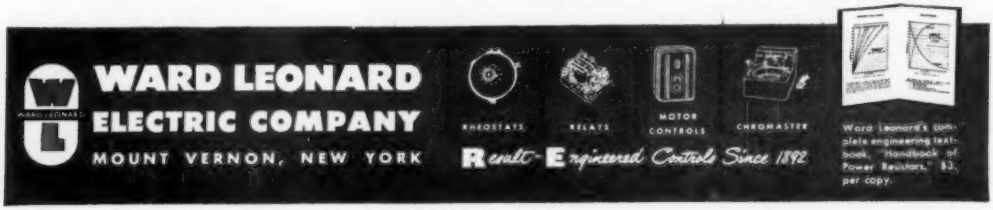
EXPORT

New York 4, N. Y. . . . Ad. Auriema, Inc., 89 Broad St.



the STETSON is part of the man

JOHN B. STETSON COMPANY
PHILADELPHIA 22, PA.

Mr. C. C. Lucas
Howell Electric Motors
Broad Street Suburban Station
Philadelphia, Penna.

Dear Mr. Lucas:

It is not every day these days that a buyer can express his thanks and appreciation to a vendor for prompt compliance with scheduled delivery dates.

I want to do just that to you and, through you, to the Howell Electric Motors. While I am at it I wish to mention, also, that we are very pleased with the quality of workmanship and cleanness of design of your motors. Because our own product owes its national eminence to quality, we feel peculiarly fitted to recognise that standard in others.

With appreciation for your individual interest and the valuable cooperation of your factory, I remain

Yours very truly,

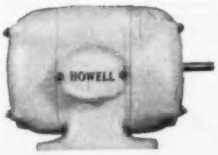
A. Kennedy, Jr.
Plant Engineer

AKjr/mc

MORE PEOPLE WEAR STETSON HATS THAN ANY OTHER BRAND

HOWELL MOTORS are part of the STETSON

HOWELL Type K Motor. Offers constant performance in the presence of dirt, dust, fumes and moisture. Sizes from 3 to 150 H.P. at 1800 R.P.M. Either vertical or horizontal mounting.



HOWELL Sanitary Motors meet the most exacting standards of the dairy and food industries. They contain no pockets, cracks, or crevices. Available for vertical or horizontal mounting.

We think you, too, will appreciate Howell's attention to your electric motor problems. Howell engineers are always ready with technical assistance on motors in the standard NEMA frame sizes or with specially designed motors if your situation requires them.

So, on the tough jobs, on every job, consult Howell — manufacturers of industrial type motors from 1/6 to 200 H.P. since 1915. Contact the Howell representative in your city or write to us direct.

HOWELL Red Band MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built Industrial Motors Since 1915

BRASS

NEED METALS?

ALUMINUM STAINLESS STEEL COPPER INCONEL* MONEL* NICKEL* STEEL

Sheet, Plate, Tube, Pipe, Wire, Rod and Bar, Extrusions, Structural Shapes... and the following INDUSTRIAL PRODUCTS: Fasteners, Tube Fittings, Pipe Fittings, Valves, Silver Brazing Alloy, Welding Material, Solder, Castings, Tube Expander Equipment, Liquid Plastic Protective Coating, Metallic Caulking Compound, Aluminum Metal Trim, Waterproof Barriers, Nails, Handrail Fittings, Low Melting Alloys, Aluminum Jacketing, Wire Cloth and Rope, and "O" Rings.

Precision Equipment for Shearing and Slitting

*Not stocked in Kansas City or St. Louis territories.

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1305 West Sunset
Fred Greer
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4419 Mimosa Street
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Phone: 4-6212

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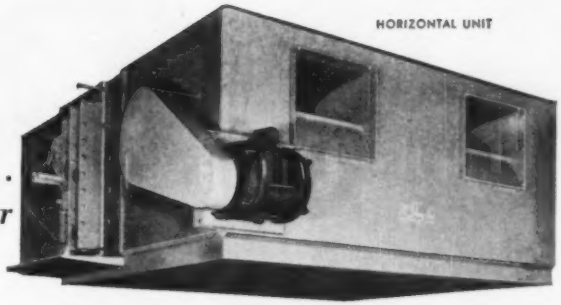
IN 8 MODELS

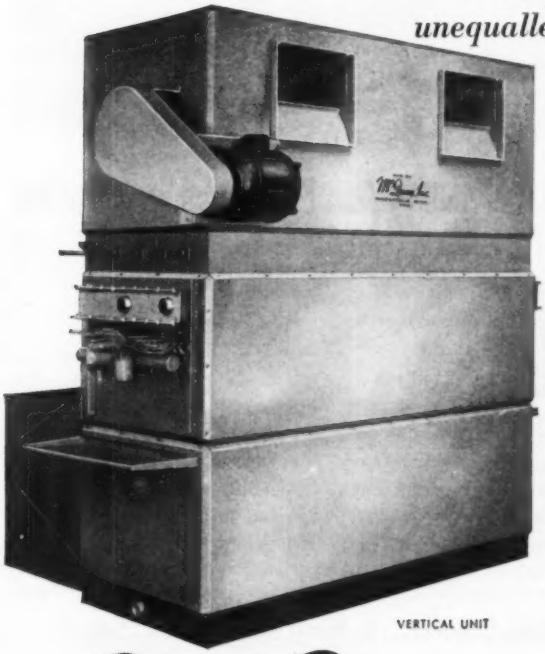
up to 65 tons cooling capacity...15,675 Cfm... 2,200,000 Btu per hour heating capacity

HORIZONTAL UNIT



McQuay CENTRAL STATION AIR CONDITIONERS

...with **RIPPLE-FIN** *construction to give you unequalled heat transfer efficiency!*



VERTICAL UNIT

Both the horizontal and vertical Central Station Air Conditioners provide year 'round comfort with cooling and dehumidification, heating and humidification, positive ventilation, and air filtering.

Each of eight models are sectionally built to give complete flexibility of arrangement and all parts are readily accessible to allow for ease of installation and service.

The famous McQuay Ripple-Fin Coils assure unmatched heat transfer efficiency. Also, because of the wide range of Cfm and Btu capacities offered, every normal heating and cooling application can be accurately met with McQuay Central Station Air Conditioners.

Auxiliary features available include: direct expansion, water, and steam coils, mixing box with dampers, "V" type and flat filter sections, humidifiers, and internal face and by-pass damper sections.

Representatives in principal cities. Write for Bulletin 502. McQuay, Inc., 1601 Broadway St. N. E., Minneapolis 13, Minnesota.

McQuay INC.

HEATING • REFRIGERATION • AIR CONDITIONING

GOOD REMEDY for business ailments

Many of the big pharmaceutical houses use Worthington air conditioning and refrigeration machinery to control chemical reactions, inhibit bacteria, prevent deterioration.

And many a corner drug store keeps up "hot weather" business by using Worthington air conditioning to make the premises inviting to customers.

No other manufacturer makes *so complete* a line. A Worthington system is all Worthington-*made* — not just Worthington-assembled — assuring you of perfectly balanced operation and unit responsibility.

Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Div., Harrison, N. J.

America's Leaders... in Many Businesses... Select

WORTHINGTON

A.2.8

AIR CONDITIONING AND REFRIGERATION

The Most Complete Line... Always the Correct Recommendation

PERFORMANCE *beyond expectations*

Drop Forged SteelS

W-S Screw-End and Socket-Weld Fittings

That's right, W-S emphasizes the *plural* when it comes to the various steels for forged fittings.

From Monel down to the full range of carbon types, including low sulphur and phosphor-controlled grades, W-S *forged* fittings spark the trend toward specialized materials for specialized needs.

What's *your* problem? STRENGTH? W-S is a leading supplier to the high-pressure, high-temperature power industry. CORROSION? W-S stainless and alloy fittings tie America's main arteries of chemical production. SANITATION? W-S is a big producer of the popular Type 304 for food and pharmaceutical operations. Low temperature? Another W-S specialty.

And there's one problem common to all . . . COST. Let us show you how W-S *forged* fittings provide the lowest *service* cost obtainable.

9-M-2

• **Stronger** • **Smaller** • **Lighter** • **Tighter**
• **More Uniform** • **Lower *Service* Cost**

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

WATSON-STILLMAN
ESTABLISHED 1848

DISTRIBUTOR PRODUCTS DIVISION
ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

mondays were really BLUE in the 90's

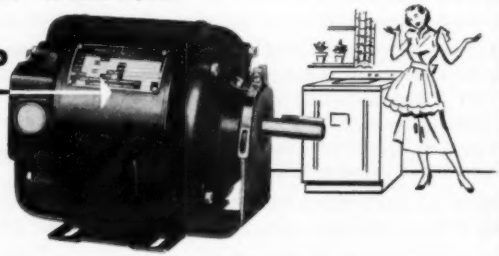
Men folks worked from sun to sun . . . but Mother's work was never done . . . in the 90's. Wash days added to her burden . . . she spent many hours toiling near a hot, kitchen stove.

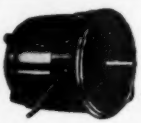
The electric motor has worked miracles to relieve mankind of time-consuming, laborious tasks and provide for the living standards we enjoy today.

Emerson-Electric is recognized as a leader in producing motors which power a long list of MODERN home appliances. To name just a few: automatic washers, ironers, dryers, refrigerators, freezers, oil burners and stokers.

Founded more than half a century ago, Emerson-Electric builds dependable, efficient motors for use in appliances and equipment for the home, on the farm, in business and in industry. Your inquiry is invited on the complete Emerson-Electric motor line, in horsepower ratings from 1/20 to 5. THE EMERSON ELECTRIC MFG. CO., St. Louis 21, Mo.

MODERN LIVING **IS POWERED WITH ELECTRIC MOTORS**





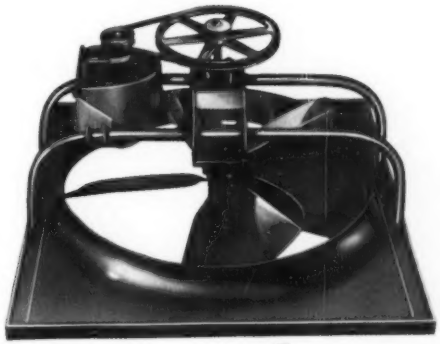
OIL BURNER MOTORS

No matter how good your Oil Burner may be, it can be no more reliable than the motor that drives it. Emerson-Electric oil burner motors are specially designed and precision-built for this job . . . they are totally enclosed, extra quiet in operation, require a minimum of maintenance and meet Underwriters' Laboratory specifications for oil burner service. Write for Oil Burner Motor Data Bulletin No. 391.

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

LEADERS IN THE FAN AND MOTOR INDUSTRY SINCE 1890

American Blower – a time-honored name in air handling



Ventura Packaged Attic Fan.

Aeropel Home Ventilator. Winner of two Fine Art Awards for beauty and utility.

Homes will be cooler, more pleasant and more comfortable when equipped with quiet-operating and efficient American Blower Ventilating Fans.

American Blower Attic Fans exhaust the pent-up daytime heat of attic and house—draw in a refreshing breeze of nature-conditioned night air.

American Blower Aeropel Fans whisk out offensive smoke, fumes and odors, maintain a fresh-as-a-daisy atmosphere in kitchens and other rooms, all year round.

The added comfort of a well-ventilated home is well worth the reasonable price and low operating cost of American Blower Home Ventilating equipment.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

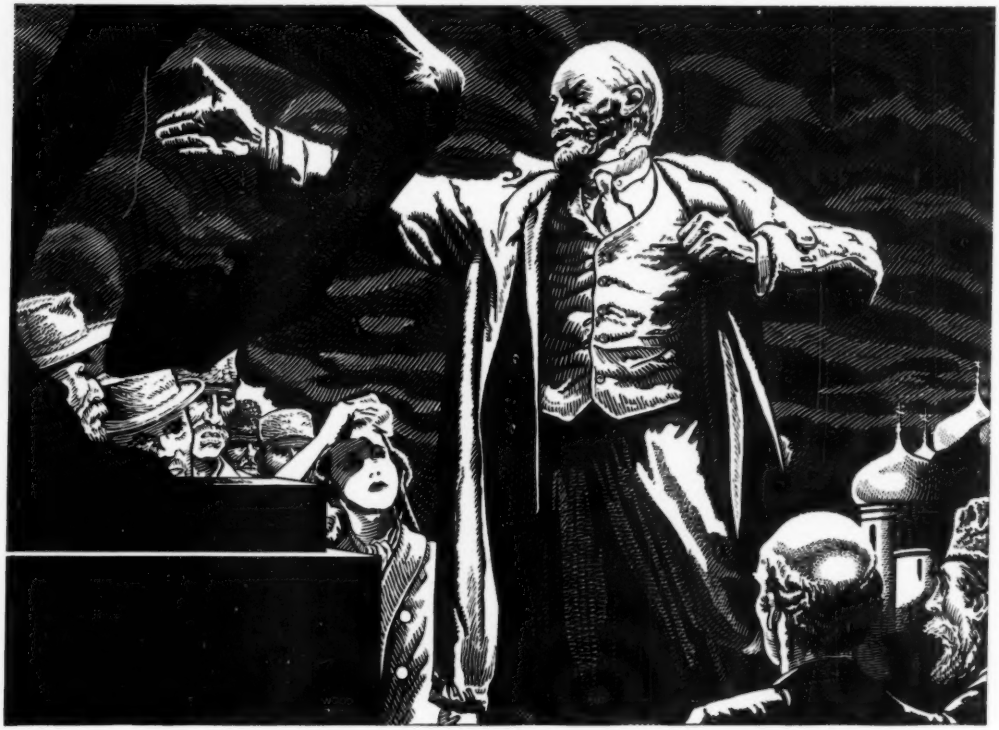
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



Let us prove this prophet false

"We shall force the United States to spend itself into destruction."

These are the words of Lenin, father of Russian Communism. Quoted from page 191, volume xxi, of his Collected Works, they were printed recently in a metropolitan newspaper.

This is the announced goal of the Politburo, and it is the direction in which many patriotic citizens fear we are headed. For example, Congress has just appropriated $87 billion to be spent during 1952, and enacted taxes estimated to produce only $71 billion. The deficit is to be added to our national debt, already $259 billion; and this deficit will depreciate the national currency by another $16 billion.

Part of this stupendous appropriation is to rearm ourselves and the free world against Communist attack. But what about the rest of our spending?... Let us also be realistic. It is time for us as a nation to pause, reflect and consider well. We can do three things to avoid naticnal bankruptcy:

1. Eliminate every non-essential federal expense.
2. Provide taxes to pay all obligations as we go.
3. Pay off some of our national debt every year.

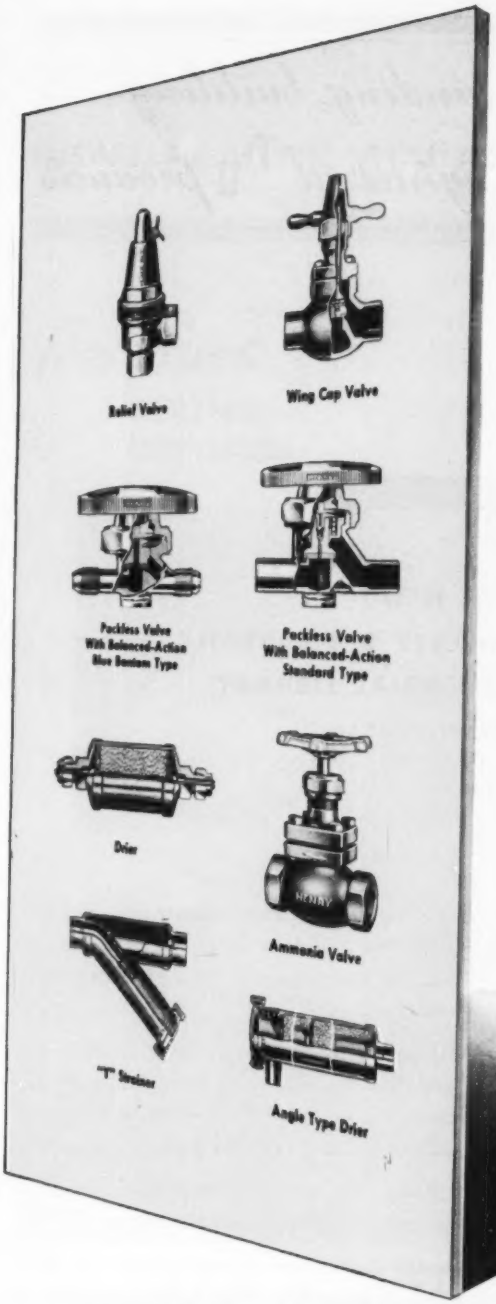
Let every citizen who believes in preserving our nation from the economic termites within, as well as from the announced enemy without, become an active worker to prove the Russian prophet false.

YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

General Offices -- Youngstown 1, Ohio
Export Offices -- 500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.



Back of These Products
is a name
that you can trust

HENRY

VALVES, DRIERS & STRAINERS

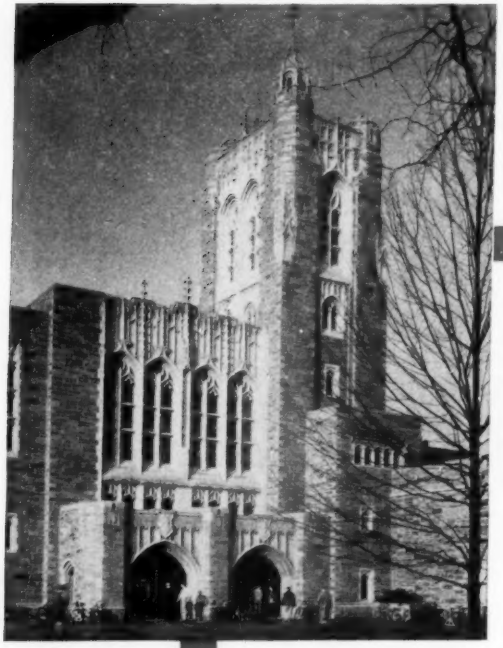
HENRY VALVE CO.

HENRY VALVE CO
CONTROLLING FLOW

MELROSE PARK, ILL. (Chicago Suburb)
CABLE: HEVALCO MELROSE PARK, ILL.

Valves • Driers • Strainers • Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications

In America's outstanding buildings... you'll find engineered T&B products



THE NEW
HARVEY S. FIRESTONE
MEMORIAL LIBRARY
at Princeton

R. B. O'CONNOR & W. H. KILHAM, JR.
Architects

MEYER, STRONG & JONES
Consulting Engineers

TURNER CONSTRUCTION COMPANY
General Contractor

ALVORD & SWIFT
Air Conditioning Contractor

Princeton's beautiful new Harvey S. Firestone Memorial Library now joins the parade of distinguished buildings in which Tuttle & Bailey Aerofuse Diffusers and Tri-Flex and Aerovane Grilles and Registers assure the engineered performance of the air conditioning system.

On contracts of such importance there can be no question about the success of the installation . . . and these Tuttle & Bailey units, backed by the Industry's most complete research, engineering and test facilities, insure the flexible precision control of air delivery necessary to meet exacting specifications.

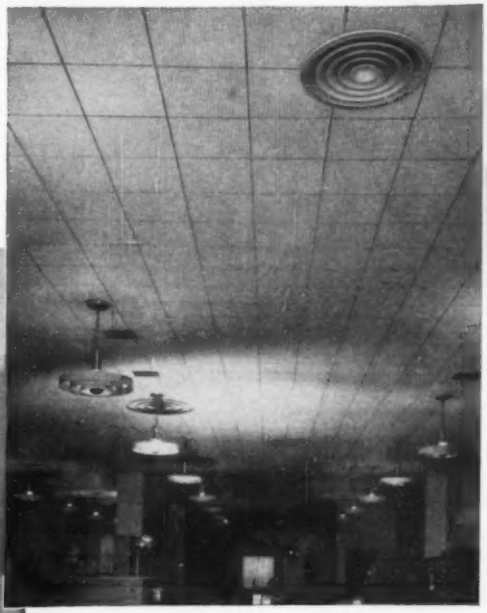
In addition, all Tuttle & Bailey units meet the standards of distinction and good taste in design so important in carefully detailed interiors.

Specify Aerofuse Diffusers and Tri-Flex and Aerovane Grilles and Registers and be sure of the best without compromise. Write us direct for Catalogs No. 104 and 48S giving full information.

4TD52

INSTALLED AT THE VITAL POINT...OF AIR DELIVERY

Aerofuse
CEILING DIFFUSERS



Tri-Flex Aerovane
GRILLES *and* **REGISTERS**

TUTTLE & BAILEY inc
NEW BRITAIN, CONNECTICUT

Open your eyes to D.T. Williams valves
Dependable! Well Engineered!
See your nearest jobber
or write for literature.
D.T. Williams VALVES
GUARDIANS OF THE PIPELINES
THE D. T. WILLIAMS VALVE CO.
Division of The Schaible Company
SUMMER STREET • CINCINNATI 4, OHIO

FIG. 912—BRONZE
"VULCODISC" GLOBE VALVE
Renewable Composition Disc • Integral Seat • Union Bonnet • Screw and Flanged Ends • 200 lbs. W.S.P., 400 lbs. W.O.G., ⅛" to 3"

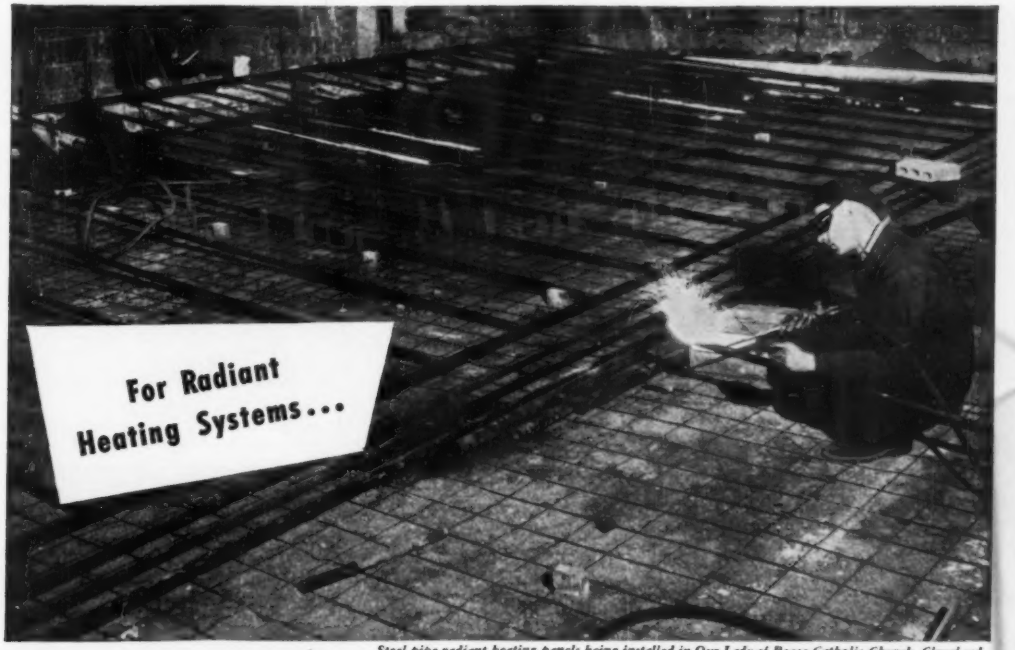
FIG. 1040—BRONZE
"ELITE" GLOBE VALVE*
Renewable Composition Disc • Copper Nickel Alloy Seat • Union Bonnet • Screw and Flanged Ends • 225 lbs. W.S.P., 400 lbs. W.O.G., ⅛" to 3"

FIG. 1000—BRONZE
"ELITE" GLOBE VALVE*
Copper Nickel Alloy Renewable Full Way Disc and Regrindable Seat • Union Bonnet • Screw and Flanged Ends • 225 lbs. W.S.P., 400 lbs. W.O.G., ⅛" to 3"

FIG. 1028—BRONZE
"ELITE" GLOBE VALVE*
500 Brinell Hardness Renewable Stainless Steel Plug Disc and Stainless Steel Seat • Union Bonnet • Screw and Flanged Ends • 225 lbs. W.S.P., 400 lbs. W.O.G., ¼" to 3"

FIG. 107—BRONZE
REGRINDING GLOBE VALVE*
Renewable Bronze Disc • Integral Seat • Union Bonnet • Screw and Flanged Ends • 225 lbs. W.S.P., 400 lbs. W.O.G., ⅛" to 3"

*Available at 300 lbs. W.S.P. (Angle and check types are also available at both 200 lbs. and 300 lbs. W.S.P.)



Steel pipe radiant heating panels being installed in Our Lady of Peace Catholic Church, Cleveland, Ohio, by Sweeney & Wise Co., Cleveland. Heating engineer is George F. Evans, Cleveland, Ohio.

REPUBLIC Steel Pipe

Goes in FAST... Goes in to STAY

● Here's the new big volume field for heating contractors. It's large-building heating with radiant panels fabricated of durable, economical Republic Steel Pipe.

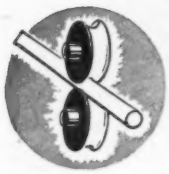
Steel pipe radiant heating systems are especially suited to the cold-weather needs of churches, auditoriums, arenas, garages, public and industrial buildings, other large-area structures. Equally suited to home heating needs. Good for snow-removal systems, too.

As you know, *steel* pipe has been the standard for closed hot-water circulating systems for many years. It has done that job well, giving long, trouble-free service. And, today's Republic Steel Pipe—made under Republic's *own* advanced continuous weld process—is even better than that which has served so well in the past.

You'll find Republic Steel Pipe highly ductile and easy to fabricate . . . just right for the close coiling and bending which radiant panels require. It threads cleanly, and welds readily to tight leak-proof joints.

It's a good idea to check with your Republic Pipe Jobber as soon as you can about pipe for the radiant heating jobs you've got scheduled. He'll be glad to give you latest information about available sizes and current deliveries.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.



REPUBLIC CONTINUOUS WELD PIPE

Easy to bend, thread and close coil
Easy to weld by all methods
Uniformly ductile
Uniformly strong
Uniformly clean and scale-free
Uniform wall thickness, diameter, concentricity
Economical uniform lengths, extra long lengths
Expansion co-efficient same as concrete and plaster

Engineers rate Modine the standard of excellence

COMPARE

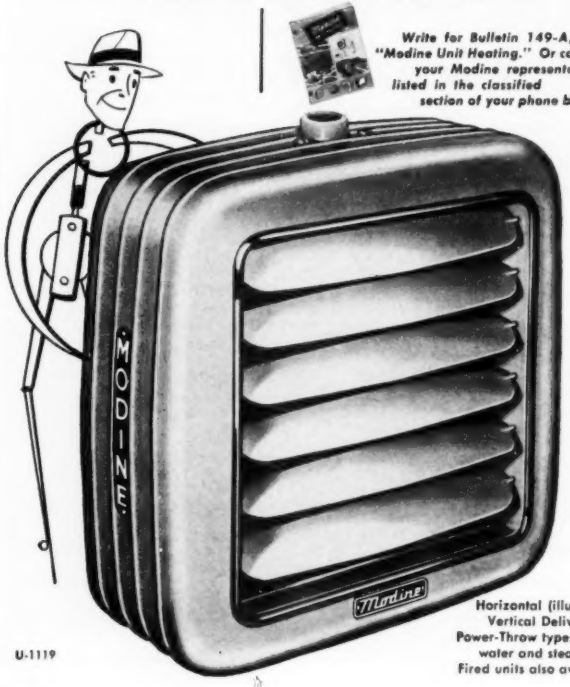
ON EVERY COUNT
MODINE UNIT HEATERS STAND OUT

Compare performance! Modine's balanced combination of discharge air temperatures, velocity and volume give you perfect heating comfort.

Compare economy! Fuel bills are smaller with Modine because heat is delivered where it's needed — not wasted at the ceiling. And installation and maintenance costs are far lower, too.

Get all the facts from your Modine representative. *Compare first* — and you'll choose Modine. Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wis.

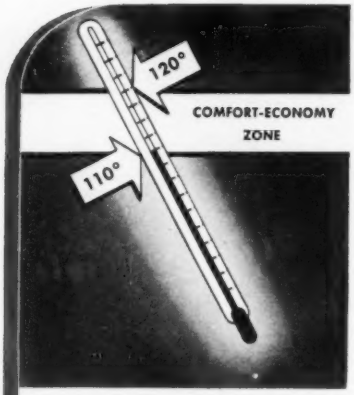
Modine UNIT HEATERS



Write for Bulletin 149-A, "Modine Unit Heating." Or contact your Modine representative listed in the classified section of your phone book.

Horizontal (illustrated), Vertical Delivery and Power-Throw types for hot water and steam. Gas-Fired units also available.

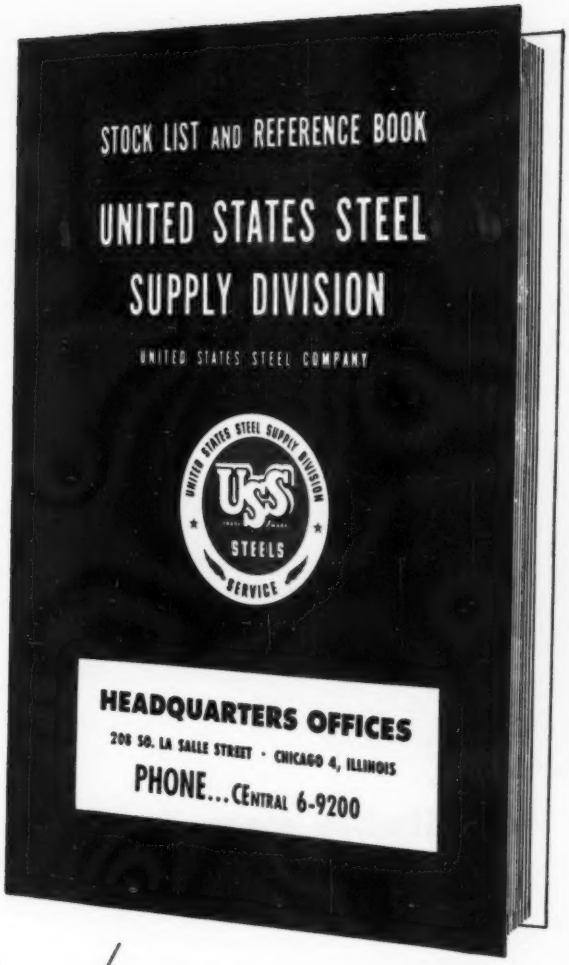
U-1119



Discharge air temperatures of 110°-120° F. are correctly related to air velocities—assure perfect heating comfort plus lower fuel costs.

Sound-silencing features assure quieter operation—certified by accurate laboratory sound ratings. Especially important for commercial and institutional use.

Sturdy, steel, integral fan guard offers safety from exposed fan — serves as a resilient, vibration-absorbing mounting for the unit's motor.



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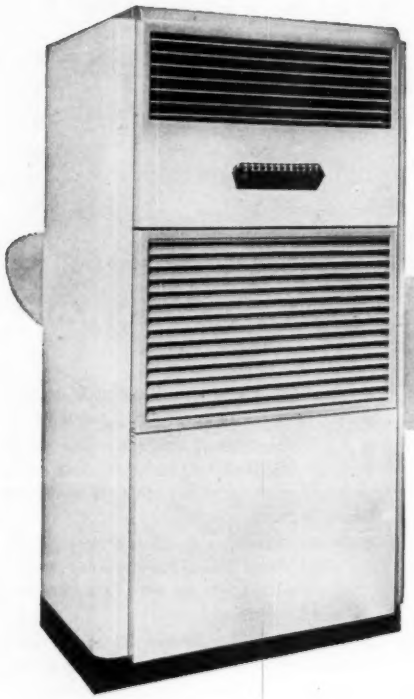

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... through your Westinghouse Air Conditioning Distributor. The UNITAIRE is completely factory-assembled and ready for use. Installation is simple and fast. It does not require hard-to-get materials. These units are adaptable, too. They can be applied singly or in multiple to condition anything from a single room to an entire floor or building.

Best of all, the UNITAIRE is the best looking, most reliable air conditioner you can buy. One reason is the famous Westinghouse hermetically-sealed compressor. There are other important reasons your Westinghouse Air Conditioning Distributor will be glad to explain. Call him today; he's listed in the Yellow Pages of your telephone directory. Or, write for free booklet to Westinghouse Electric Corp., Air Conditioning Division, Hyde Park, Boston 36, Mass.

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Keep customers comfortable and department store sales go up. That's been proved time and again. So, in the new Southtown store of Famous-Barr Co., St. Louis, you'll find Kno-Draft *Adjustable* Air Diffusers.

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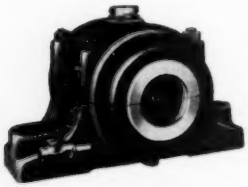
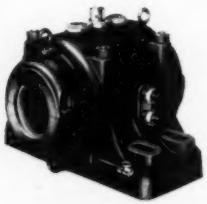
QUIET DODGE BEARINGS

THE MOST COMPLETE LINE FOR FAN AND BLOWER SERVICE



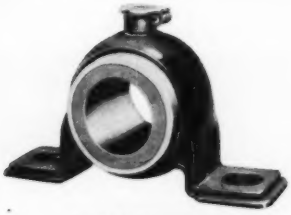
SLEEVOIL PILLOW BLOCK

A precision-built, ring-oiling babbitted bearing, self aligning and exceptionally quiet in operation. Special seals prevent oil leakage and keep dirt out of the bearing.



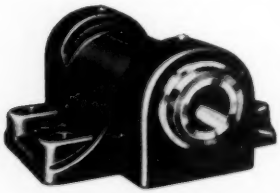
WATER-COOLED SLEEVOIL

Specially designed for applications where elevated temperatures are encountered. Dodge Sleevoil bearings combine quietness with exceptional load carrying capacity; are available in shaft sizes from 1-11/16" to 8".



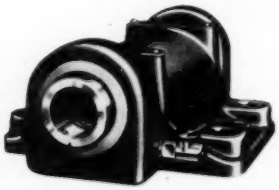
DODGE BRONZOIL

Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir with close fitting wick around bushing provides ample lubrication. Oil resistant grommets available for noise isolation. Sizes 1/2" to 1-1/4".



BALL BEARING PILLOW BLOCK

Single row, deep groove ball bearings. Inner race extended to form sleeve which carries shaft. Piston ring seals retain lubricant, exclude dirt. For arrangement No. 2. Shaft sizes 15/16" to 2-1/4".



BRONZE BUSHED PILLOW BLOCK

Designed for arrangement No. 2 installations. Two bronze bushings of high lead content and T section rings, sealed against dirt. Composition rings inside thrust collar prevent oil leakage. For shaft sizes 15/16" to 2-3/16".

CALL THE TRANSMISSIONEER
your local Dodge distributor, for information about the entire Dodge line of bearings for fan and blower service. Look for his name in the Classified Telephone Directory under "Power Transmission Equipment." Or write to the factory.

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Skilled Airfoil designers drew, tested and built it to give architects, contractors and engineers the *finest door grille possible*. It's made to OUTLAST—OUT PERFORM.

First—*it's more rugged*. Will withstand heaviest use and abuse for years and years. Second—*it's low in cost*, competitively priced. Third—*it's good looking*. Will add beauty every time it is installed. Fourth—*louvers are absolutely secure*. Do not rattle when door is slammed.

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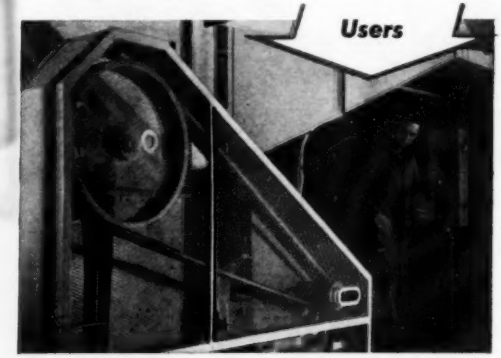
Variable Speed Drive *Saves Everybody's Time*

and money too on Air Conditioning Jobs!

Save Engineering Time. You need only figure approximate fan speeds when working out the drive. Later, exact air flow is easily set on job by simple adjustment of *Vari-Pitch* sheave.

Save Installation Time. System balancing is fast and easy with *Vari-Pitch* sheaves because the sheave pitch diameter can be quickly changed without dismantling the drive.



Save Adjusting Time. Seasonal changes may require adjustments in air flow. These can be made quickly with *Vari-Pitch* sheaves without dismantling drive and switching sheaves.

Use *Vari-Pitch* Drives on your next job. Ask an Allis-Chalmers engineer to show you how easy it is to engineer the drive. Call your nearby Allis-Chalmers Authorized Distributor or District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3678

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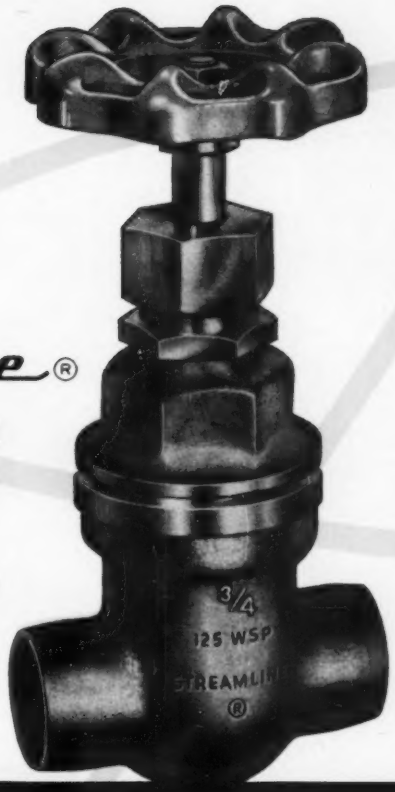

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SOLDER TYPE GATE VALVES

for dependable, long lasting service

See your jobber for further information or write for catalogs S-351 and W-251 describing our complete line of STREAMLINE wrought copper and cast bronze fittings.

The new Streamline solder-type gate valve is built for durable operation in the 125# steam working pressure class of general service.

Its engineering design was perfected after many months of testing. Careful machining of seat and wedge disc gives positive shut-off with light pressure. Special lug design eliminates the possibility of installing disc backwards. And, non-rising stem allows installation in minimum amount of space.

The Streamline gate valve, which is furnished in a complete range of sizes from ½" nominal through 2" nominal, is an extremely rugged, seep-proof unit that will withstand the most severe usage and yet consistently give positive shut-off. Get the full facts today.

Streamline fittings are available in a complete range of standard sizes.

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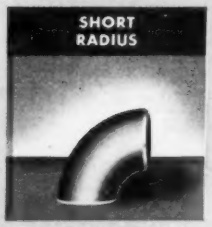
MUELLER BRASS CO. PORT HURON 1, MICHIGAN

WELDING FITTINGS ON YOUR MIND

It will pay you to think of Midwest whenever you think of welding fittings. For example: the variety of elbows offered only by Midwest provides greater latitude in piping design and permits improvements and economies not otherwise possible.

Same radius as ASA but tangent equal to 25% of nominal pipe size on each end. Saves pipe, layout and welding time. Costs no more than ASA. Sizes to 24".

Dimensions conform to applicable size range of American Standard for Butt-Welding Fittings, ASA B16.9. Tolerances much less than allowable. Sizes to 26".



Recommended where space limitations do not permit use of "Long Tangent" or ASA Elbows. Sizes to 30".

Takes the place of a straight size elbow and a reducer. Eliminates one weld, reduces pressure drop, easier to insulate. Sizes to 12", reductions to half size.

4580

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all three agreed it would provide four definite savings

Immediately after this small Motorpump was used for recirculating water in air conditioning systems all agreed that at last they had a different pump with lower hp that would do the work of ordinary pumps of higher hp. Yes, the man who bought the air conditioning unit on which the pump was installed, the contractor who put in the system and the I-R engineer who helped design the pump found that the Motorpump *offers* four definite savings.

1. **Saving in *first* cost**
2. **Saving in weight and space**
3. **Saving in installation costs**
4. **Saving in power costs**

This remarkable Motorpump is just one of the results of 90 years of Ingersoll-Rand research and experience. The Motorpump has proved itself to be higher in efficiency and reliability when compared *size* for *size* with *any* other type pump used on air conditioning systems today!

Knowing this, you can't honestly afford to pass up the savings this Motorpump offers. Certainly, it's worth your investigation. For facts and figures, contact your nearest I-R distributor or representative. Meantime, write direct for this booklet, "A Picture of Improved Pumps for Air Conditioning" Ingersoll-Rand Company, 11 Broadway, New York 4, New York.

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90 years of BIG PUMP know-how packed into small pumps for air conditioning application

MOTORPUMP

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ADJUSTABLE PARALLEL HEATER...

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Gives Your Customers

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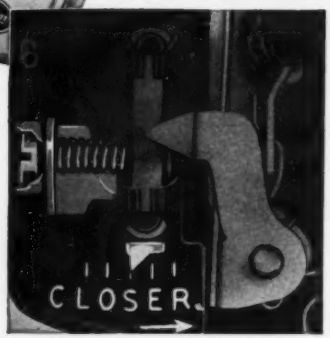

a turn of a screw

tailors temperature control to fit any installation!

DETROIT'S No. 411-CH *Timed Cycling* Thermostat is a natural for all your new installation and conversion jobs. Equipped with an easily adjustable parallel heater, the No. 411-CH can be swiftly adapted with minimum effort to provide maximum comfort under a wide variety of installation conditions. With a simple turn of a screw, cycles can be shortened or lengthened to fit the specific installation without disturbing the factory settings. Because the unique *Timed Cycling* parallel heater is not affected by variations in the electrical load, this remarkable thermostat may be used on *all* types of installations and is particularly well adapted to conversion burner work where the heating unit is either over or under size. In addition, the *Timed Cycling* Thermostat eliminates the need to select a special heater by giving you *one* heater adaptable to *all* jobs. This exclusive feature greatly simplifies inventory, installation and service problems and assures your customers the utmost in heating comfort. For complete information see your DETROIT wholesaler today.

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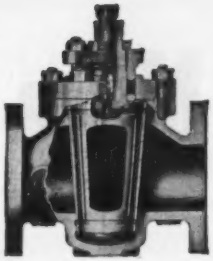
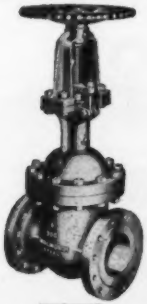


Walworth
Lubricated Plug Valve



Walworth
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Walworth
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Walworth manufactures a *complete line* of valves and pipe fittings: all made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, Walworth products reflect more than a century of experience in the manufacture of quality valves and fittings.

Your Walworth distributor will give you full information on the *complete line* of Walworth steel, iron, and bronze, and special alloy valves and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

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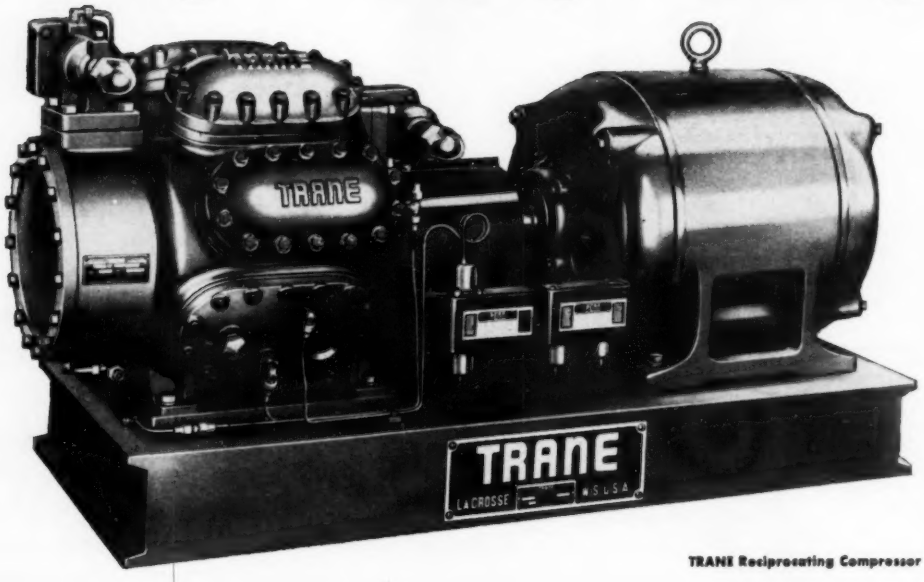
More proof TRANE great reciprocating



TRANE Reciprocating Compressor

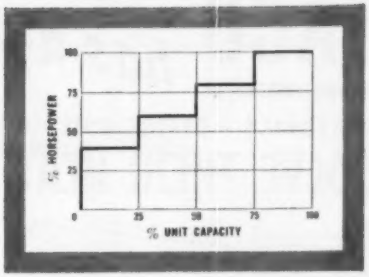
Complete air conditioning from a single, easy-to-install TRANE unit

A MARVEL IN COMPACTNESS!

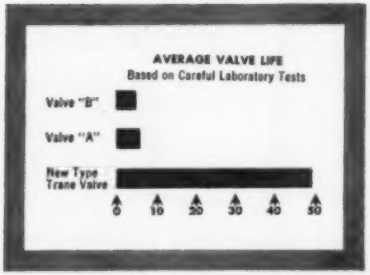
TRANE SELF-CONTAINED AIR CONDITIONER. Here's a year-round air conditioning unit that takes a minimum of space for the job it performs—a boon for stores, restaurants, offices. From 3- to 20-ton sizes, with built-in evaporative condenser optional in 15- and 20-ton models. Easy to install. Heating coil optional. For more information see TRANE Bulletin DS-362 and 362-A.

makes a compressor!

More evidence appears daily that the new TRANE Reciprocating Compressor is living up to the greatest expectations. You want modern design—TRANE Reciprocating Compressor delivers it! You must have efficient performance—TRANE delivers it! You expect long life, quieter operation, simplified installation and maintenance—TRANE has delivered that too, on the line!



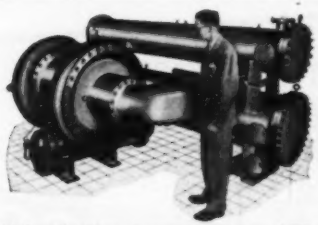
PROOF: More Power Saving When Loads are Reduced! TRANE hydraulic cylinder unloader reduces horsepower when cooling load is reduced. It's completely automatic and internal—suction pressure controlled, oil pressure actuated.



PROOF: More Hours of Operation from Valves! That's because TRANE ring plate valves have a special surface treatment for long life. Tests prove TRANE valves have up to 8 times the life of other valves tested under the same conditions.

No other compressor offers all these features!

- **UNLOADED STARTING** . . . permits use of normal torque motor.
- **FOAM BREAKER** . . . reduces loss of oil from crankcase when oil foams from start-up.
- **OIL PRESSURE PROTECTION SWITCH** provides a second guard against lubrication failure.
- **QUIETER OPERATION** because of dynamically balanced construction and direct drive.
- **SIMPLIFIED INSTALLATION** with fewer connections to make on job—it's factory assembled!
- **MODERN DESIGN** with two piston sizes, 2, 4 and 6 cylinders, 10- to 50-ton capacity. Available with shell-and-tube condenser above compressor.
- **SMOOTHER OPERATION** because of carefully balanced lightweight aluminum pistons and connecting rods.



TRANE CenTraVac. A complete water-chilling system, hermetically sealed. Capacities as low as 45 tons! Power consumption very closely proportionate to load through entire range. Saves power. Saves money. TRANE Bulletin DS-399 provides complete data.

For FULL INFORMATION about the TRANE Reciprocating Compressor and these other great TRANE refrigeration products, contact the TRANE representative in your area, or write the main office, La Crosse, Wisconsin.

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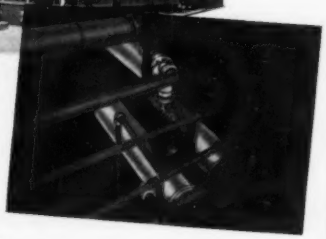
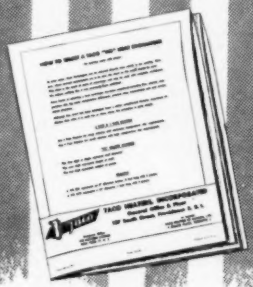
Taco water heaters are supplying abundant low cost hot water in industrial plants throughout the United States. Our more than 30 years' experience in this field is a big help to those with hot water heating problems.

Heats entire building with heat formerly thrown away



A large industrial user of steam was dumping the condensate from their steam processing into a creek. Now, thanks to the 3 Taco heat exchangers on the right, they're reclaiming enough to heat the 220′ x 560 building shown above. Taco products can perhaps do a similar service for you.



ENGINEERS . . . WRITE FOR

simplified selection chart for sizing Taco water heaters under any conditions such as steam pressure, temperature rise and pressure drop.

A TRAINED TACO SALES ENGINEER IS AVAILABLE WHENEVER YOU NEED HIS HELP

Better Heating-Better with Taco

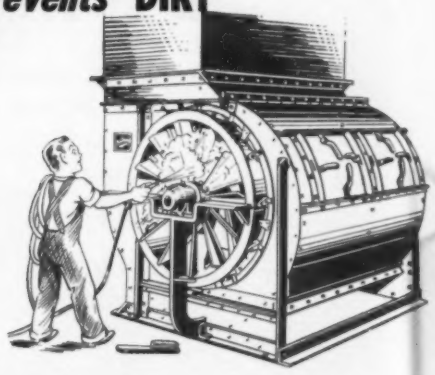
TACO HEATERS, INCORPORATED 137 SOUTH STREET • PROVIDENCE 3, R. I.

"Buffalo"

Tips on Getting the Best Service from your **Fans**

REGULAR CLEANING *Prevents* DIRT *From* UNBALANCING FAN ROTORS

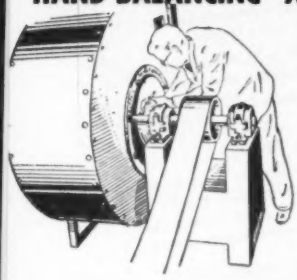
When a little dirt collects on a fan blade, more dust, dirt and grease will lodge there. Eventually, this can unbalance the entire rotor, gradually affecting fan performance and causing vibration which could burn out bearings, spring shaft and loosen the foundation. Periodic cleaning by wire brush, scraper or compressed air as shown at right can head off these troubles. "Buffalo" rotors are balanced at our factory by modern precision equipment, and if kept clean, should remain so indefinitely to give you vibrationless performance.



Far left, balancing fan wheels at the Buffalo factory

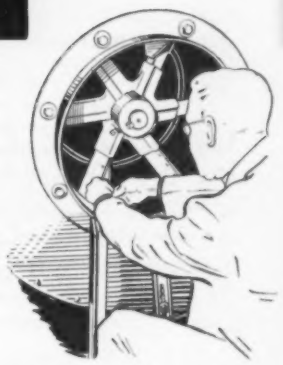
Left, a Buffalo Double Width Induced Draft Fan

HAND-BALANCING A ROTOR BY CHALKING SHAFT



Clean shaft, Run fan up to speed. Hold point of sharpened chalk stick so that it just touches shaft. This will scribe a line on the shaft — the shorter the line, the greater the unbalance. Have U-shaped weights ready for trial balancing.

Place a trial weight on heel of blade 180 deg. away from chalk mark. Repeat test runs with varying weights until a line is made all around the shaft; then the wheel is in balance. A complete instruction booklet is yours on request, describing the procedure in detail.



"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

171 MORTIMER ST. BUFFALO, NEW YORK

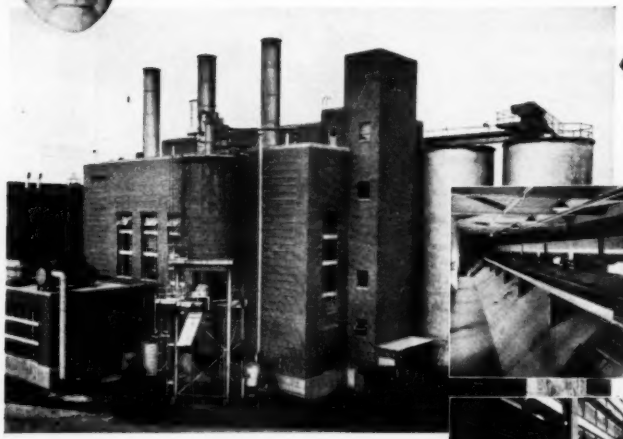
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

"$52,000 A YEAR—THAT'S WHAT JEFFREY SAVES BY BURNING COAL THE MODERN WAY!

AUTOMATIC, DUSTLESS COAL HANDLING SAVES US $9,980 IN LABOR ALONE," says H. W. deBruin, Vice President in Charge of Manufacture, The Jeffrey Manufacturing Company, Columbus, Ohio



This modern plant supplies steam to Jeffrey's 48-acre tract of buildings and operations. The new boilers have bettered their expected thermal efficiency of 78%. Compared to the old boiler plant, Jeffrey now gets 20% more steam using the same amount of fuel.

The enclosed screw conveyor, shown at the left, delivers coal to the bunker over the firing aisle. *The entire coal handling system is controlled by one man.* Compared to the old method, Jeffrey saves $6,080 annually in car-unloading costs alone. Ash removal is completely automatic and dustless, too—saves another $3,900.

The plant's firing aisle—showing the two-ton traveling weigh larry that delivers coal to the boilers. Steam generating costs, not including depreciation, are—**old plant, $.598 per thousand lbs. . . . new plant, $.455 per thousand lbs. Total savings, including savings in coal handling . . . exactly $52,904 annually!**

● Handle coal efficiently, fire it properly, and you can save *big* money! Today, modern coal handling and combustion equipment add greatly to *bituminous* coal's inherent economy. You can now get anywhere from 10% to 40% more power from each ton of coal than was possible a few years ago.

If you are planning to modernize your present installation, or if you're building a new steam-generating plant, call in a competent consulting engineer. He'll show you how it will pay you well to burn coal in a modern installation designed to meet your specific needs.

And with coal you get a future dependability no other fuel can offer. Of all America's fuel reserves, 92% is coal. And to supply this coal, America has the world's most productive coal industry. For economy, for dependability, both now and in the future, you can count on coal!

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
WASHINGTON, D. C.

If you operate a steam plant, you can't afford to ignore these few down-to-earth facts!

COAL in most places is today's lowest-priced fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

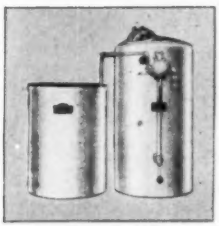
FOR HIGH EFFICIENCY FOR LOW COST

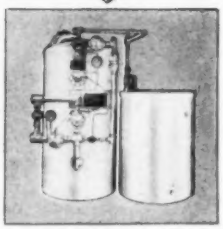
YOU CAN COUNT ON COAL!

BRUNER

WATER CONDITIONING & PUMPING EQUIPMENT

Engineered to the job





Heavy-duty models — 80 to 160 gpm. 600,000 to 1,200,000 gr. cap. Carried in stock. UPPER LEFT, Solo Valve. UPPER RIGHT, Dial-O-Matic. LOWER RIGHT, Brucex Feeder for corrosion control and prevention of red water. *Write Dept. HPA for catalog.*

Pictured on the job at the Methodist Hospital of Central Illinois at Peoria, Illinois is a BRUNER Industrial heavy-duty model engineered to produce 70,000 gallons of pure soft water from water of 26 gr. hardness. This installation is another example of BRUNER design and manufacturing craftsmanship that assures absolute satisfaction.

●

It will pay you to get the recommendations of the Bruner Corporation laboratories if you have a problem in the field of water softening, filtering or conditioning. Your inquiry will receive prompt attention. Of course, there is no obligation.

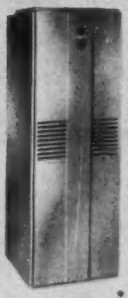
"America's Most Complete Line of Quality Water Softeners and Filters"

"You save a lot more than space with this broom-closet furnace"

says Hess Swallow,

Bryant, Detroit Branch Manager

"Out of sight, out of mind" is by far the *safest* approach to concealed heating. Such equipment has to be *right*—or it's all wrong, and few can afford to have that happen. Making things *right* is an old Bryant custom, and it certainly has paid off in the way you've accepted our *Vertical Forced-Air* Furnace. It has paid off for *you*, too, in the way this compact, highly efficient gas furnace has performed—in thousands of single dwellings, more thousands of multiple-housing units, over the country. Completely automatic and occupying as little as two square feet of floor space in the smaller sizes, the Bryant Vertical Gas Furnace can help you cut construction costs while providing more living space for homemakers. Your Bryant Distributor will be glad to give you all the details and help you fit the Bryant Vertical into your plans. Or you may write Bryant Heater Division, Dept. 124, Affiliated Gas Equipment, Inc., 17825 St. Clair Avenue, Cleveland 10, Ohio.



Bryant Model 304
Winter Air Conditioner

Gas-fired, forced-air furnace. Six sizes, with inputs from 45,000 to 145,000 Btu per hour. Approved by A. G.A. for all gases. Features *Hevigage* Heat Exchanger and *Push-Button* Ignition (city gases only).

bryant *best buy*

IN HEATING,
AIR CONDITIONING,
WATER HEATING

"NO SUBSTITUTES FOR US! WE'LL USE THIS TILL WE CAN GET OUR READING COPPER TUBING."

Today, of course, much of our production of long-wearing Reading Copper Tubing is earmarked for essential defense orders. But, you can count on our continued cooperation to keep you supplied with as much tubing for civilian use as government restrictions permit.

READING COPPER TUBING

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Producers of Reading Lektroneal Copper Tubing and Reading 85% Grade A Red Brass Pipe

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nyb FANS

SKILLFULLY ENGINEERED ACCURATELY RATED FEATURE HEAVY WELDED STEEL CONSTRUCTION

Type ME Centrifugal Fans

Two types of fan wheels. Housing dimensions remain the same but performance characteristics differ.

Slow speed wheels offered from 7½ to 73 inch. Capacities up to 70,000 CFM.

Quiet operating, medium speed (PL) wheels with non-overloading horsepower characteristics for heating, ventilating and air conditioning or industrial applications. Wheel diameters from 18 inch to 73 inch, with any speed or discharge required. Capacities up to 123,000 CFM. Class I, II, III or IV construction.

All-welded housings featured as standard construction for simplicity, extra strength and rigidity —dust tight and leak proof. Bolted (knock-down) type available in Class I and Class II. Split housing can be furnished as extra if required.

Write for Bulletin 493

nyb

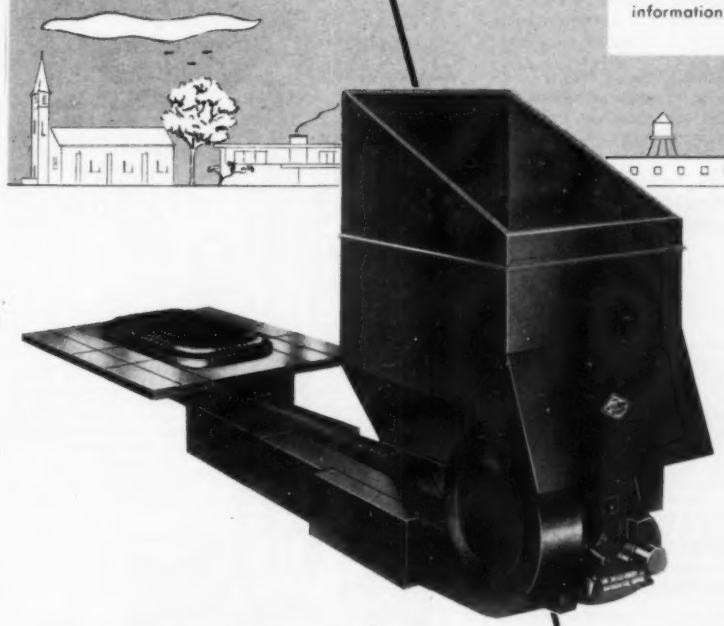
THE NEW YORK BLOWER COMPANY

SALES OFFICES • 32nd STREET and SHIELDS AVENUE • CHICAGO 16

FACTORY, LAPORTE, INDIANA

Will-Burt Stokers open new horizons to DEALER PROFITS

If your stoker sales are not what they should be . . . if some of your profits go down the drain in excessive service calls, better see about Will-Burt. You'll find Will-Burt stokers sell because the quality is known — and *proven*. Outstanding features like the exclusive air control, patented safety shear pin and rugged over-all construction help you close a sale faster and easier. Will-Burt's complete range of sizes in both domestic and commercial models give you a wide market in any area where bituminous coal is burned. Bin feed models are available in addition to the hopper feed model shown. Investigate these new horizons in dealer profit today. Write, wire or phone for additional information.



Write on your letterhead for the Will-Burt stoker data book with engineering facts, dimension and installation drawings, suggested specification sheets, etc. Valuable!

OTHER WILL-BURT HEATING PRODUCTS

Gas and oil conversion burners

Residential hot-water heating boilers

WILL-BURT

THE WILL-BURT COMPANY

DEPARTMENT H ORRVILLE, OHIO

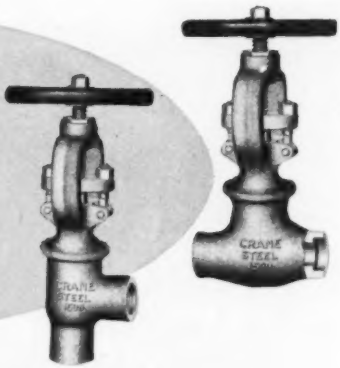
NEW CRANE

SMALL STEEL VALVES

WITH *REVOLUTIONARY* LIP-SEAL
(PATENTED)

BONNET JOINT

1500 AND 2500-POUND CLASSES



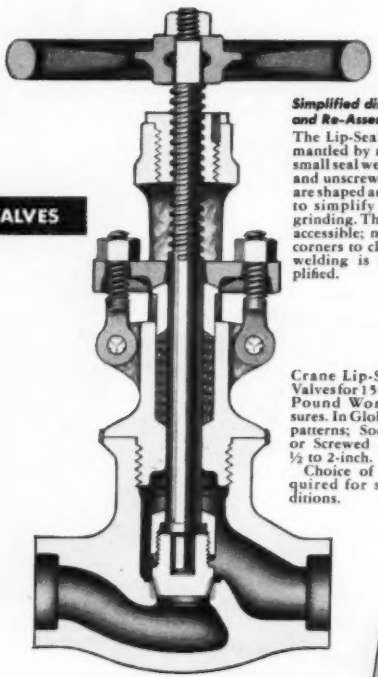
Look closely at the Lip-Seal Bonnet joint of this new Crane small steel valve. A small bead of weld metal seals the joint against leakage—yet the entire mechanical load, both pressure and stem thrust, is carried by strong threaded members.

Here is bonnet joint improvement that brings you important benefits beyond tight sealing and freedom from maintenance.

For example, Crane Lip-Seal design permits a weight-saving, more compact structure without sacrificing strength or reducing seat area. It combines significant developments for improved flow control, ease of operation, and durability. Add to these the ease with which the Lip-Seal joint may be dismantled and re-assembled—and you have a valve with outstanding suitability for your high-pressure/high-temperature power service needs.

DESIGNED AND TESTED TO GIVE YOU:

- **Absolute Tightness**
- **Freedom From Bonnet Joint Maintenance**
- **Minimum Weight and Bulk**
- **Easier Dismantling and Re-Assembly**



Simplified dismantling and Re-Assembly

The Lip-Seal joint is dismantled by removing the small seal weld on the lips, and unscrewing. The lips are shaped and positioned to simplify removal by grinding. They're entirely accessible; no pockets or corners to clean out. Re-welding is equally simplified.

Crane Lip-Seal Bonnet Valves for 1500 and 2500-Pound Working Pressures. In Globe and Angle patterns; Socket-welding or Screwed Ends. Sizes: ½ to 2-inch.

Choice of Steel as required for service conditions.

YOU GET FEATURES LIKE THESE IN LIP-SEAL VALVES

SWIVEL DISC-STEM CONNECTION—Minimizes vibration—provides long pilot guiding for disc. Design makes a more rigid—yet swivel-free—connection.

FULLY GUIDED STEM—Smoother, easier to operate. Fully guided by long yoke bushing and long engagement with lower end of bonnet. Gives positive, straight-line seating.

TWO-PIECE BALL-TYPE PACKING GLAND—Assures uniform load on packing. Prevents binding on stem even when nuts are not pulled up equally.

DURABLE PLUG-TYPE DISC—Has wide seating contact not easily damaged by foreign matter or by wiredrawing. Taper of disc permits close flow regulation while throttling.

STELLITE-FACED SEATING SURFACES—Effectively withstand corrosion and erosion; highly resistant to wear, seizure, galling, and abrasion. Seat is integral with body.

EASY ACCESS TO STUFFING BOX—Ample space within yoke legs allows convenient re-packing. The swinging type gland eye-bolts swing completely clear.

This Circular Ready For You

Your copy of this 8-page booklet supplied free on request. Gives complete information on Lip-Seal Valves, including materials, service recommendations, sizes, and dimensions. Ask your Crane Representative for a copy or write direct.

The Complete Crane Line Meets All Valve Needs. That's Why,
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

LOOKING AHEAD . . .

NEB BURNAM, Editor

"Pipe as pipe is simply pipe, but when installed in a piping system it becomes industry's most important method of transportation." That statement (and a rather complicated one it now seems to be) appeared in an article on process piping in one of the early issues of HP&AC. Involved as the sentence is, it does state a fact —piping IS industry's greatest transportation system judged on almost any basis (miles in use, importance to modern manufacturing, or what have you).

For this reason, piping in all its forms as used in all industries is a field of engineering and contracting in itself, has been and continues to be given major editorial attention regularly each month since the inception of HP&AC.

* * * * * * * * * * *

We mentioned on this page in March the editorial kick we got out of running our Question of the Month department. Another of our "standard features" is "Open for Discussion", which follows the usual custom of engineering society meetings in providing a place for comments on—and criticism of—the papers and talks which have been presented to the membership.

In our "Open for Discussion" department, the same opportunity is given HP&AC's readers to comment on, amplify or criticize previously-published articles. No one has the final answer to any of the problems that come up in such vigorous, growing branches of engineering and contracting as heating, piping and air conditioning. Thus, you'll find in "Open for Discussion" each month useful additional data to supplement previous articles, other viewpoints to aid in the understanding of a certain subject.

* * * * * * * * * * *

Anything Can Happen is a new editorial feature that started off with a bang, we think, in last month's HP&AC. It's based on the idea that we've all had trouble of some kind or another on heating, piping or air conditioning jobs—trouble that shouldn't have happened, but did . . . We'll welcome your help in contributing incidents from your own experience to keep this department going each issue. It'll give you a chance to get the incident off your mind and at the same time help others avoid the same mistakes. As they say on the television commercials, "write today".

in Heating

"Looking backward" (rather than "looking ahead") is the theme of two articles we'd like to mention as soon to appear in HP&AC. The idea in looking backward at heating practices and methods of other days is, however, to give a better understanding of today's techniques and a better foundation for the future. It's somewhat indefinite as to just when these articles will be ready for publication, but if we promise them here, perhaps the authors will turn on the heat. One of them, it is planned, will review a large contracting firm's heating work over 75 years—the other devoted to methods of heating a large department store over the past century.

in Air Conditioning

Instead of the more usual self-contained coolant pump for each machine, a centralized coolant system involving quite a bit of piping is used at an old automobile plant which has been entirely remodelled. The coolant is drained continuously from the machines, is cleaned, and then pumped back for re-use. The scheme has a number of advantages which will be discussed—along with the piping involved—in an article which has been prepared for early publication.

in Piping

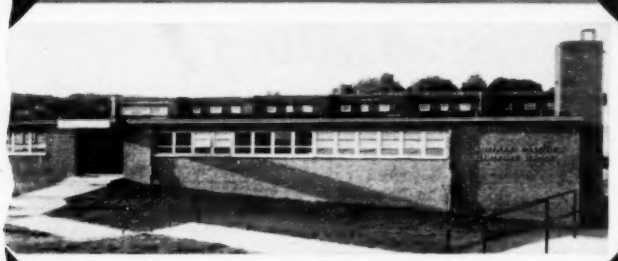
Air conditioning for precision manufacturing plants will be rather thoroughly reviewed in an article scheduled for publication within the next month or so. While the subject is almost limitless in its scope, the article will be confined to manufacturing industries where quality control, precision of operations or other contributing factors make air conditioning essential or beneficial. Actual "case histories" will be included.

EVERY MONTH . . *in HP&AC: The Journal Section of The American Society of Heating and Ventilating Engineers . . . Back-of-the-book departments on equipment, trade literature, new books and reports, meetings and conventions, news notes . . . Sam Lewis' Page, Data Sheet, "Open for Discussion", The Law and Your Profits, The Editor's Pages.*

PAGE 1

1952 TEMPERATURE CONTROL ALBUM

the place



Hoffman Boston Elementary School
Arlington, Virginia

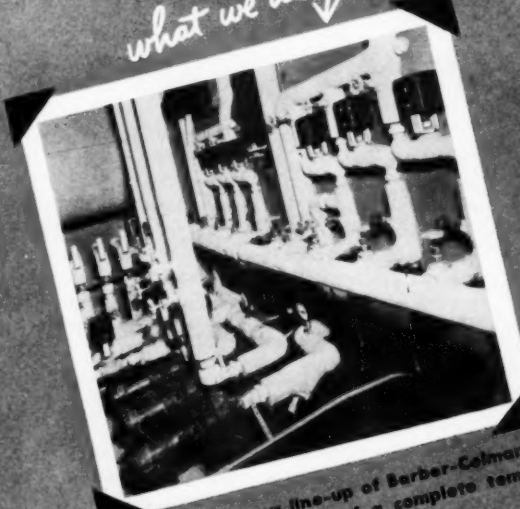
who was there

Architect:
Ronald S. Senseman
Washington, D. C.

Engineer:
A. Dee Counts
Washington, D. C.

Heating Contractor:
E. J. Febrey & Co.
Washington, D. C.

what we did



Above photograph shows line-up of Barber-Colman Motor-Operated Valves, part of a complete temperature control system.

notes of interest

A central hot water converter is controlled by a Barber-Colman CYDK Dual Bulb Microtherm*, 1 to 1 ratio, controlling a steam valve. The radiant heating system is divided into three zones—two zones of three classrooms each, and one office section zone. Each classroom has a valve and thermostat. When all rooms in a zone are satisfied, the pump for that zone stops. When the office section is satisfied, the valve for that zone closes and, in turn, stops the pump.

*Reg. U.S. Pat. Off.

BARBER-COLMAN COMPANY
1228 ROCK STREET • ROCKFORD, ILLINOIS

For the complete story on Barber-Colman Controls, write for Catalog F-2287-2.

BARBER COLMAN

SERVEL Air Conditioning

offers an amazing new kind of dependability and operating economy!

Don't be satisfied with *less* than the *best* when you sell air conditioning equipment. Sell Servel and offer proven dependability . . . dependability backed by *a written warranty five times as long* as any comparable sized unit on the market today! Sell the *exclusive flexibility of operation* that permits your customer to choose the *most economical power source* for his installation, his locality. Sell the smooth, silent, vibrationless "*no moving parts*" operation of Servel's famous absorption cooling unit. The proven unit that delivers peak performance year after year with an absolute minimum of maintenance.

Your *customer gets more* for his money . . . *you sell more* and *earn more*—when you feature and promote Servel, the *quality* line of air conditioning equipment!

You can offer *four exclusive advantages* when you sell Servel!

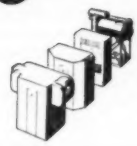
1 Servel uses present steam sources!

Connect Servel units to present steam source . . . use gas, oil, LP gas, waste heat or steam at any pressure. With Servel *you* pick the most economical energy source, keep operating costs low!

2 "No moving parts" design cuts maintenance!

Because there is nothing in the Servel absorption principle refrigerating unit to wear . . . it delivers silent, continuous operation, top performance with a bare minimum of maintenance.

3 Custom fitted to do each job best!



Want to air condition a store, office or factory? Need chilled water for processing? Want cooling only . . . or year 'round air conditioning? Servel has the unit or combination to do it best.

SELL SERVEL . . . the air conditioning that offers low operating cost, guaranteed dependability in residential, commercial or industrial installations.

4 Servels are guaranteed five times as long!

Each Servel refrigeration unit is warranteed for five full years! That is five times as long as all other comparable units. What greater assurance of long life and dependability can you get?

Get the facts and you'll sell Servel!
Write for complete information *today*.

Servel, Inc., Dept. HPAC-4, Evansville 20, Indiana

Gentlemen:

I'm interested in the money-making advantages of selling Servel Air Conditioning Equipment. Send me full details on ( ) Industrial ( ) Commercial Units.

NAME _____

FIRM _____

ADDRESS _____

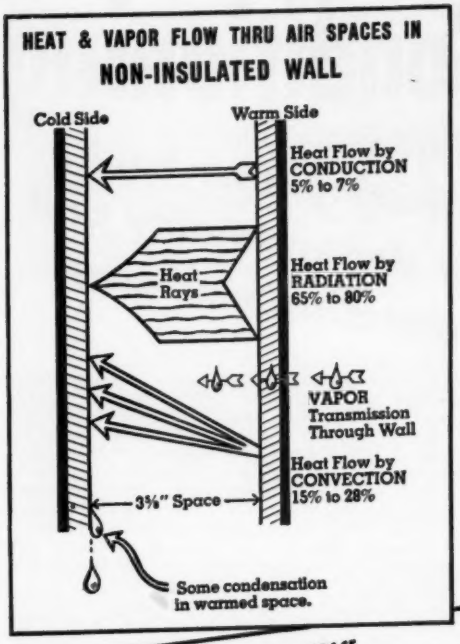
CITY _____ ZONE _____ STATE _____

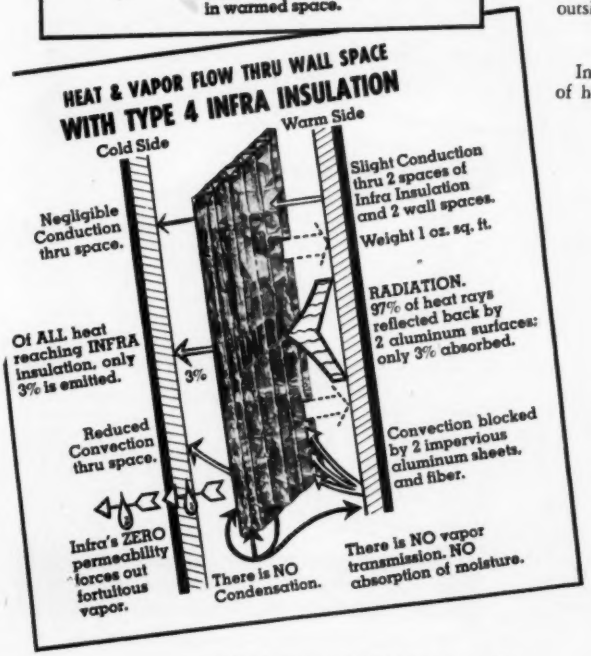
Servel

AIR CONDITIONING

Made by the makers of the famous Servel Refrigerator

SERVEL, INC. Evansville 20, Indiana





INFRA THERMAL FACTORS. TYPE 6

Up-Heat	C.089, R 11.23 =	4⅗" dry rockwool
Wall-Heat	C.073, R 13.69 =	5⅛" dry rockwool
Down-Heat	C.044, R 22.72 =	9" dry rockwool

INFRA INSULATION, INC.—525 Broadway, New York, N. Y.

INVISIBLE OPEN WINDOWS AND TRAP DOORS DRAIN HEAT IN WINTER, LET SUMMER HEAT IN

Doors and windows may be tightly shut, every chink and cranny caulked and weatherstripped, yet heat may flow out of a structure or in, right through solid walls and internal wall spaces, as if through open windows.

Obedient to nature's law, heat flows through *space* by radiation, in the form of invisible rays, from warm to cold; from warm humans, animals, furniture, walls, ceilings, floors; to colder ceilings, walls, floors, furniture, animals, and human beings. Heat also flows by conduction through *solids* when these warmer objects touch colder objects. Even the warmth in the air convected to and in contact with the wall flows into the wall by direct conduction. ("Wall" is used as a general term. The principle applies to walls, floors, ceilings and roofs.)

But preponderantly, it is radiation which wall, ceiling and floor surfaces inside a room absorb. These rays are transformed to heat which then passes through the wall by direct conduction, as does heat acquired by the wall by conduction and convection. The entire process is repeated, radiant flow preponderant, inside the wall *space* in the direction of the inner surface of the colder outer wall. The total heat which is caused by absorption of radiation mingling with the convected heat which has been absorbed by conduction, flows through the outer wall by conduction. It is finally dissipated in the colder, ambient air outside mostly by radiation but also by convection.

Heat Flow Reversed in Summer

In summer, the process is the same but the direction of heat flow is reversed; from the warm outside walls toward the colder interior walls, to be finally transferred mostly by radiation, but somewhat by convection, to the occupants of the building.

Radiation accounts for 55% to 80% of heat flow through building spaces; convection 15% to 40%; conduction 5%. Multiple accordion aluminum sheets reflect 97% of radiation, and each aluminum and fiber sheet is an effective convection block. Being mostly air, 1 oz. per sq. ft., there is almost no conduction.

Multiple accordion aluminum is non-condensation-forming. It has zero permeability to all gases—water vapor, hot and cold air, etc. No dewpoint can be reached on its surfaces or within it. It can neither sustain nor retain fortuitous moisture, for instance, rain leaking in, but expels it as a vapor because its permeability in ratio to exterior walls is infinity and the minimum requirement is 1 to 5.

Multiple accordion aluminum is available as Infra Insulation, Types 4, 6, and 4 Jr. For an amplification of this discussion, get FREE "Simplified Physics of Vapor and Thermal Insulation."

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THE EDITOR'S PAGES

TWO IDEAS THAT AID AN ENGINEERING MEETING

TWO IDEAS WE NOTICED — and liked — at the 28th annual meeting of the American Society of Bakery Engineers could well be adopted by other similar groups, we think.

One of them is a printed "reaction card" distributed to everyone attending a session and intended to be dropped in a ballot box at the door at the session's end. The card lists each of the subjects discussed at the session, asks the listener to "evaluate frankly" each subject as excellent, good, fair or poor. Presumably, the votes are tabulated and influence the planning of the following year's program.

The other good idea was a "break" — just a few minutes — for some music right in the middle of an all-morning technical session. Of course, you must have — and the ASBE does — a few members with musical talent to swell the chorus.

FUMES DIDN'T COME FROM AIR CONDITIONING

NEWSPAPER REPORTS indicated that some of the passengers on the City of San Francisco streamliner suffered ill effects from gas fumes after the train was stalled in the Sierra snows last January. It is the opinion of the Southern Pacific's motive power people that the air conditioning design and installation were not at fault.

Apparently, some fumes from the exhaust of the propane engine generators, with which some of the cars in the train are equipped, did enter the train, according to the Southern Pacific. It is believed that after the train had been standing for some time and the snow had built up on one side to about window level and on the other as high as the roof, the exhaust gas from the engine generator motors was more or less trapped under the cars and some seeped in through the frozen toilet bowl traps and through some of the vestibules.

As soon as presence of the fumes was detected, the engine generators were shut off, exhaust fans were turned on at full speed, and the vestibule doors were opened. The fumes were quickly dissipated and those who had become ill soon recovered, with no apparent after effects, the S. P. reports. Laborers dug snow away from the cars so the accumulation of fumes underneath could be cleared out.

INTERPRETATIONS OF PRESSURE PIPING CODE

FROM TIME TO time, reports of certain actions of the Sectional Committee B31 on the American Standards Association Code for Pressure Piping, sponsored by The American Society of Mechanical Engineers, are issued for the information of interested parties. While these do not constitute formal revision of the Code, they may be utilized in specifications, or otherwise, as representing the considered opinion of the Committee.

Pending revision of the Code for Pressure Piping, ASA B31.1-1951, the Sectional Committee has recommended that selected interpretations be published so that industry may take immediate advantage of corresponding proposed revisions.

The following information is reprinted from the April issue of *Mechanical Engineering* by special permission of the publisher, The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N.Y. Case 5 appeared on page 61 of the August 1951 HPAC, and Case 7 was given on pages 117-118 of the October 1951 HPAC.

Case 5 Annulled

Case 5 has been annulled because the stresses provided by this case are lower than the new stresses adopted by the ASME Boiler Code and therefore this case is not necessary.

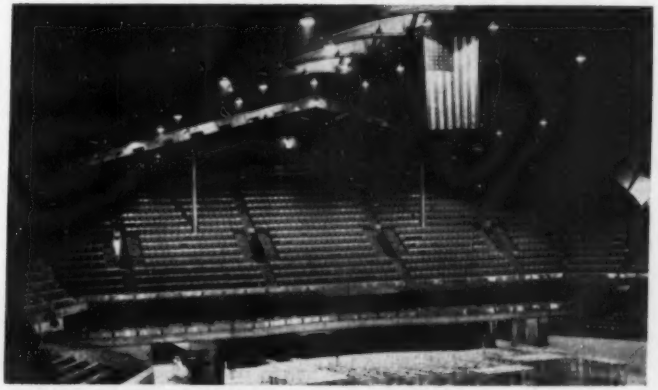
Case 7 Corrected

Section E of this case was inadvertently omitted. Section E should read "60% of the average or 80% of the minimum stress to produce rupture in 100,000 hours as reported by test data."

HALOGEN LEAK DETECTOR REDUCES PLANT SHUTDOWNS

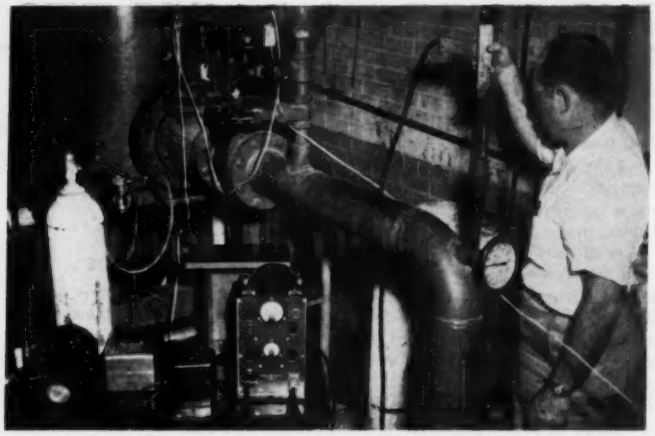
A SMALL, PISTOL-LIKE leak detector has minimized shutdowns in a system which deodorizes more than 10,000 lb per hr of vegetable oil at the Sherman, Texas, plant of Mrs. Tucker's Products, Div. of Anderson, Clayton & Co.

AMPHITHEATRE AIR CONDITIONING PROGRESSES



The International Amphitheatre, Chicago, in whose huge arena Republican and Democratic "gladiators" will battle for their Presidential candidates next summer, is acquiring a series of sheet metal "arches" which are in reality ducts some 90 ft above the floor. The International Heating, Ventilating & Air Conditioning Exposition will be held in this same building next January, during the week of the annual meeting of the American Society of Heating and Ventilating Engineers. A. Epstein and Sons, Inc., are the consulting engineers for the air conditioning installation, the piping contractor is William A. Pope Co., and the ventilating contractor is Narowetz Heating & Ventilating Co. (United Press photo)

OPERATOR AT PLANT of Mrs. Tucker's Products Div. sprays a vacuum system with "Freon". If a leak is present, the gas is pulled into the system and conveyed to the leak detector installed in the exhaust outlet



LEAK DETECTOR IS inserted in the exhaust pipe of the deodorization process. Sensitive to halogens, the detector has minimized shutdowns in a vacuum system which helps to process more than 10,000 lb per hr of vegetable oil

The deodorization process — the final step in a refining system which makes crude soybean and cottonseed oils suitable for use in shortening, margarine, salad oil and cooking oil — depends upon a nearly absolute vacuum. If leaks allow sufficient air to enter the system, the entire unit must be shut down.

In the deodorization system, the oil is heated to a high temperature under a vacuum of 0.3 in. of mercury and superheated steam is bubbled through it. If air leakage is such that the pressure rises to 0.4 in. of mercury, the unit must be shut down. Allowing it to continue processing under adverse vacuum would result in an inferior product.

The leak detector, which reacts to halogen gases, is normally used to find minute leaks in pressure systems. At Mrs. Tucker's plant, the probe of the detector is inserted in the vacuum system's exhaust pipe and the output of the control unit is connected to an automobile horn which sounds an alarm when a leak is present. Using a portable cylinder of "Freon" gas, a workman goes over the system, spraying it with the gas. If a leak is present, the "Freon" is drawn into the system and taken to the exhaust pipe where the detector is installed. The device reacts to the "Freon", the horn sounds, instruments indicate the intensity of the leak, and the position of the workman shows the approximate location of the trouble to be corrected.

One big advantage of the leak detector, according to Robert Wilson, Mrs. Tucker's foreman of deodorization, is that the system doesn't have to be shut down while testing for leaks — the "Freon doesn't mix with the oil, but is carried through and out of the system along with other waste gases.

Standard procedure at Mrs. Tucker's is to check at least once a month for leaks, or when various other instruments indicate leaks might have developed.

Prior to installation of the leak detector, the only way Mrs. Tucker's engineers had of finding leaks was to shut down and apply air pressure to the vessels. Leaks then were found by painting the suspected locations with soap solution. [Photos courtesy General Electric Co.]

PIPING FABRICATORS ASK ADVANCE NPA ALLOTMENTS

FABRICATORS OF METAL piping informed the National Production Authority, U. S. Department of Commerce, recently that if they could receive their steel allotments sufficiently in advance of the quarter when they are to be used, one of the major problems of the industry would be solved.

The industry is operating at only 50 to 75 percent capacity at present, the Fabricated Metal Piping Industry Advisory Committee told NPA. Moreover, numerous orders for pipe fabrication must be rejected because of the uncertainty of procuring materials from steel mills. Many fabricators are running six months behind schedule on the orders they have, they pointed out.

The industry was told that it may expect to continue facing serious shortage of steel pipe. NPA pointed out that the demand for nickel-bearing stainless steel is currently running 212 percent of supply. Where there has been a softening in the demand, it has been in the higher priced steels which piping fabricators do not normally use.

NPA does not foresee any easing of demand for seamless pipe during 1952. In fact the demand may be expected to increase. It is hoped, however, that some idle pipe mills may resume production. Otherwise a readjustment in mill schedules will be the only way that more seamless pipe can be made available, NPA said.

Committee members recommended that NPA devise a plan to consolidate the industry's requirements of alloy pipe to permit the placement of orders on the mills in larger quantities.

The committee opposed issuance of an order similar to M-44 which covers production scheduling of heavy power plant equipment. It said such an order would be unduly restrictive and would place an unnecessary burden on the industry since many fabricators have only small contracts.

Typical view showing Webster Walvector ® providing heat the full window length, column to column. The steam risers and the returns are in alternate columns. Webster Radiator Valves provide shut-off of the heat in each bay.

Steam Cost 12% under estimate

The Commerce Building, first new office building in Harrisburg since 1935, is obtaining Webster Tru-perimeter Heating results with Webster Moderator low-pressure steam heating, using 12% less steam than estimated.

The Pennsylvania Power & Light Co. estimated the cost of steam for heating at $3,527 per season. Meter readings for the first complete heating season showed steam cost of only $3,101, less by $426 than the estimate.

Architect William Lynch Murray specified a Webster Moderator System to assure "controlled-by-the-weather" economy in this 13-story building; Webster Walvector ® to spread the heat the full length of exposed walls.

Edward H. Bower, managing director and co-owner, says: "The continuous radiation beneath continuous window bands is just what we need. All sections of the building heat evenly, rapidly and comfortably regardless of outdoor weather conditions."

Webster Tru-perimeter Heating with steam or hot water is a development you will want to know more about when planning new buildings or extensive modernization. It is a development of the Webster organization—with direct representatives in 65 U. S. cities working with architects, engineers and heating contractors in the solution of specific problems of heating. Write us or get further information from your Webster representative.

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WEBSTER

MODERATOR

SYSTEM

OF STEAM HEATING

"Controlled by the weather"

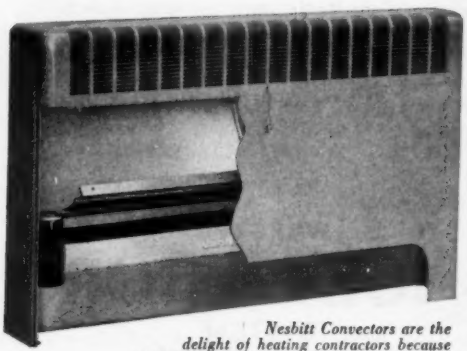
Commerce Building, Harrisburg, Pa. Architect: William Lynch Murray & Associates. Mechanical Engineer: Benj. A. Johnson. Heating Contractor: Herre Brothers.

Inset shows the heart of the Webster Moderator Control. Variator and Electronic Pressure Control Unit shown here operate in conjunction with the following equipment not shown: Outdoor Thermostat, motor-operated Main Steam Control Valve, and extended tube orifices installed in each Walvector ® unit.

How many of these *advantages* do you get in the *convectors* YOU buy?

Model U Convectors provide clean, uniform heat as well as comfortable radiation.

You get all these in **NESBITT** Model U Convectors



Nesbitt Convectors are the delight of heating contractors because of their light weight and ease of installation.

Scientific design: an *engineered* product resulting from 40 years of Nesbitt *pionairing* in the comfort heating field. ☐

Superior construction: of heavier than customary furniture steel; sturdily reinforced; built up to a reputation, not down to a price. ☐

Artistic styling: conformable to the best décor; rounded edges; functional curved-top grille for added heating capacity. ☐

Pleasing finish: phosphated metal, hardcoated in a neutral prime gray that takes a color coat well, but does not require it. ☐

Universal application: to one or two-pipe hot water systems (forced or gravity), or to two-pipe steam systems. ☐

Optional placement: the one casing may be installed free-standing or semi-recessed, as desired, with front easily removable. ☐

Easy connection: with universal headers tapped for every practicable hookup without removal of element from casing. ☐

Stock sizes: modular lengths in two heights, offering 23 standard sizes—from wholesaler stock—for practically every requirement. ☐

Honest ratings: in generous conformance with Commercial Standard 140-47 and approved by the Convector Rating Committee. ☐

Individual packing: fully assembled in a durable corrugated carton for delivery to the job in mint condition. ☐

Dampers optional: in complete separate packages, with all attachments, for easy installation, originally or later. ☐

Competitive prices: with the savings of large-volume, production-line manufacture passed on to you. ☐

Reliable guarantee: against original defects in material or workmanship, for one year from date of shipment. ☐

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"OPEN FOR DISCUSSION"

We follow here each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to participate. Address your comments to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2

HOW MUCH ENERGY COMES FROM SUN?

IN THE SHORT ARTICLE on power from the sun, page 81 of the February 1952 HPAC, the statement is made "that enough sunshine drenches the roof of an average one-family dwelling in 30 minutes to light, heat and run the electrical appliances for an entire year". This statement greatly exaggerates the power of the sun, as was drawn to my attention by Robert A. Miller, Pittsburgh Plate Glass Co., chairman of the American Society of Heating and Ventilating Engineers technical advisory committee on heat flow through glass.

Outside the earth's atmosphere, a square foot surface perpendicular to the sun's rays will intercept about 425 Btu per hr. This figure is known as the solar constant and varies a maximum of 3½ percent during the year because of the changing distance between the sun and earth. Atmospheric absorption and scattering reduce this quantity to something of the order of 300 Btu per hr per sq ft on a cloudless day when the sun is at its highest.

If the projected area of the house on a plane normal to the sun's rays were 700 sq ft, the maximum amount that would be intercepted by the house would be $700 \times 300 \times \frac{1}{2}$, or 105,000 Btu in ½ hr — possibly enough to heat the house for 3 hr in cold weather. This energy is by no means completely wasted, since it warms the exterior surface of the house or passes through its windows, thereby reducing the heat requirements below the level which would be required in the absence of the sun.

The problem of utilizing the sun's energy directly is an intriguing one and deserves much more attention than it now receives. The most attractive use of the sun's energy, from the standpoint of efficient utilization, is for space heating. It has already been demonstrated that this is technically possible. Though at present the cost of an installation is excessive, it seems likely that developments of new materials for and methods of collecting and storing solar energy will reduce these costs. The extensive application of this method of utilizing solar energy therefore appears to be principally a matter of economics.—GEORGE V. PARMELEE, Research Associate, American Society of Heating and Ventilating Engineers Research Laboratory.

REPLY—The exaggeration pointed out by Mr. Parmelee in our "sun motor" story is distressingly evident to us. We confess an error which is difficult to trace.

The "sun motor" story underwent a thorough checking by a number of experts. In the process of copying, editing and revising, some figures were twisted. The error was unnoticed by all of us who should have noticed.

Truly, we apologize. For obvious reasons, we don't distort facts in General Motors science and engineering stories. Many people who read them would be justified in exposing any exaggerations — just as Mr. Parmelee did.—JOSEPH H. KARSHNER, General Motors Corp.

PIPEFITTING SAFETY RULES AGREE WITH OURS

THE SAFETY RULES for pipefitting in maintenance and construction work, published in Data Sheet form in the March HPAC, follow very closely the safety rules and practices at present in effect at our own plant. In a few places, they go into some more detail than we do in our operating procedures and they differ in one minor and one major respect.

First, we have found that the requirement of wearing safety glasses at all times by maintenance employees is difficult to sell. We do insist on their use on hazardous operations, during tank entry, etc., and try to sell (on the basis of self-protection) their use at other times. However, this is not compulsory.

The major difference between the procedure outlined and one with which we take considerable exception is the degree with which the responsibility is fixed on the maintenance group. We feel that this responsibility must be shared by the production areas in which the men are working, since they by virtue of operating the departments are a great deal more familiar with changing hazardous conditions and, also, are on the spot most of the time to check on the complete following of various safety rules in their areas.—C. E. KNIGHT, Plant Engineer, Plastics Div., Monsanto Chemical Co.

PROVIDE ACCESS TO DUCTS FOR CLEANING

WHEREVER A DUCT system for heating, ventilating or air conditioning is laid out, preparation should be made for future access to all ducts. Regardless of the air filtering media, there is a certain amount of fine dirt that passes through the filters and lodges in the ducts. Eventually, when this dust is completely dried, and (for some reason or other) a sudden change of air velocity occurs, the result is a dust storm in the room. If you have ever experienced one such incident, you won't ask for another.

If accesses are conveniently located, it is more likely that the ducts will be cleaned of such accumulations of dust. We learn through experience. This is merely a suggestion, but well worth considering.—JOHN MESSMER, Superintendent, Milwaukee County Courthouse.

AIR CONDITIONED STORAGE VAULTS IN OLD MINES

COMMENTING ON THE article describing the air conditioning of the underground storage vaults, published in the March HPAC, the idea of a storage vault in a mine for protection of valuables against military destruction is not new. It was done in Europe during World War II.

It seems to me we have many more

locations in this country where such installations may be made. For example, the Cumberland mountains in Kentucky along the Big Sandy river have many thick seams of coal above the valley floor which have been worked out, leaving plenty of high-ceiling, dry, ventilated space suitable for long-time safe storage.

These spaces could readily be fitted out for storage and air conditioning added as needed, all of which would be much simpler than in the case of pit mines.—G. K. SAURWEIN, Mechanical Engineer, Negea Service Corp. of New England Gas and Electric System.

AIR PANELS FOR HEATING OR COOLING

I HAVE THE FOLLOWING comments to make regarding the article on air panel heating and cooling for floor or ceiling use, by R. P. Goemann, which was published in the March HPAC:

1) Panel response would seem to be very slow and, in that respect, on a par with all other imbedded-conductor types of radiant panels.

2) Since the system exhausts air from the panels into the rooms, good control of air temperature can be maintained (if a high quality diffuser return system is used), as was proved at the University of Illinois several years ago.

3) Since the load on the system will be equivalent to the usual air load plus the thermal load imposed by the structure, the total load on the heat exchangers will be greater than with conventional convection or air systems. This is particularly true in cooling where recent investigations have shown that the structure normally absorbs quite a bit of radiant energy which a conventional system does not have to deal with. This increased air load is just the reverse of recent progress which has, by means of radiant panels of the "wet type" and high velocity air systems, reduced air handling equipment to about one-sixth the size required in conventional systems. Movement of thermal energy by air is more expensive than by water and the proper blending for temperature control involves bulkier and more costly apparatus.

4) The composite ceiling surface — with its mixture of perforated acoustical pans, solid radiant pans, luminaires and outlets — would not seem to meet modern architectural standards of aesthetics.

5) Floor panel cooling is basically unsound — unless overcome by some other feature of design — due to the stratification of cold air about the feet or lower body while leaving the all-important head and torso overheated. We are all familiar with a similar result where floor type bell diffusers were used to introduce cold air on the floors of theaters.

6) The temperature at which either the floor or ceiling may be operated during cooling is, of course, a function of the dew point temperature which can be economically maintained within the structure. Therefore, no universally applicable figures can be quoted.

7) The air path would seem from the description in the article to be exceedingly tortuous, with a consequently high resistance to flow. The requirement, therefore, would be for excessively large blowers and excessive power consumption. Even then, in all probability the system would have to be restricted to unit installations of small area.—ALBERT T. JORN, Chief Development Engineer, Architectural Products Div., Burgess-Manning Co.

NITROGEN OXIDES IN DIESEL EXHAUST

I WOULD LIKE TO add the following to my previous comment on diesel locomotive shop exhaust:

Nitrogen oxides in diesel exhaust, rather than aldehydes or carbon dioxide, account for a major part of the toxicity problem. For a complete discussion of toxicity in diesel exhausts, refer to U. S. Bureau of Mines Reports of Investigation 3508 and 4381.—AMOS TURK, Director of Research and Development, W. B. Connor Engineering Corp.

DRAFT IS OBJECTIONABLE AIR MOVEMENT

I BELIEVE THAT W. B. Pride is quite correct in his statement on page 73 of the March HPAC that a draft is an objectionable air movement. The word has attained a meaning synonymous with the word "cold" and is thought of as undesirable. I do not recall anyone ever speaking of a draft as creating comfort.

Of course, in our own field of endeavor, we do use the word "draft" frequently as something desirable, especially when we are speaking of a draft in a chimney. However, the average layman knows very little about the term in this respect and uses the word only when he feels uncomfortable.—H. G. Gregerson, George L. Dahl, Architects & Engineers.

INCREASE RECOGNITION OF ENGINEERING

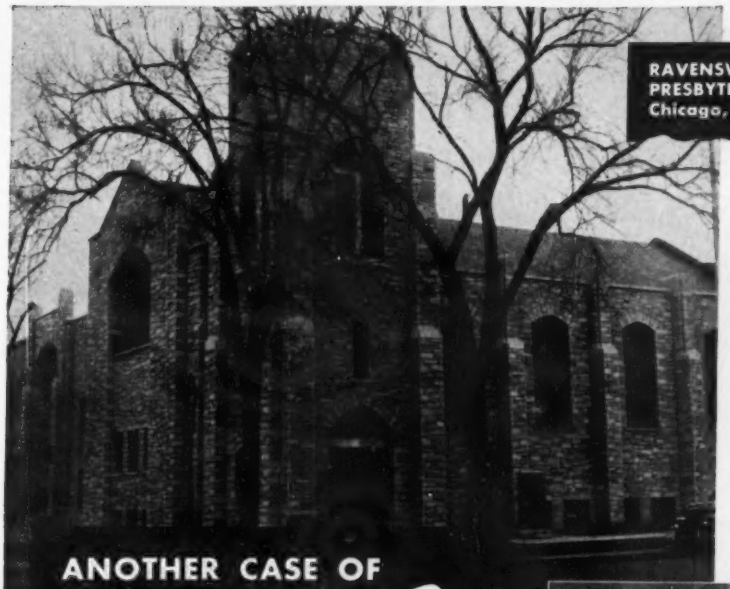
THE PROPOSED EXPANSION of the Engineers Joint Council is an excellent move, in my opinion, to unify the engineering profession and consequently give a much needed boost to the social recognition of its members. Due to many contributing factors, being an engineer in the United States has been a somewhat dubious honor — much unlike the situation in other countries.

In Europe and South America, for instance, the engineering profession is more nearly parallel to law or medicine. In South America the engineer even signs his name with "Ing." In the U. S. he is something of a glorified technician or specialized mathematician to his friends, who often ask, "What does an engineer do?" This is an appalling state of affairs, in a nation whose world leadership so depends on the efforts and accomplishments of its engineers.

Social recognition does not necessarily mean monetary payments or wages. The ever-present quibbling by some groups about minimum fees and salaries does very little to improve our station. We can never expect to obtain a universal yardstick for engineering charges — anymore than we can expect to compute a coefficient which when applied to any problem will give the answer.

Do we need a good publicity agency, which in simple terms can explain the non-technical details of how the engineer's work affects the lives of Mr. and Mrs. John Q. Public? Much of this is being done, but much more is needed. The public is always interested in knowing why! Mr. Public might discuss engineering as he does sports or politics if he were acquainted with the facts.

What is lacking? What can we do to improve our lot? These are questions which every engineer, in every field of endeavor, should ask himself and his associates. — LOUIS A. WARNER, Engineer, Westcott and Mapes.

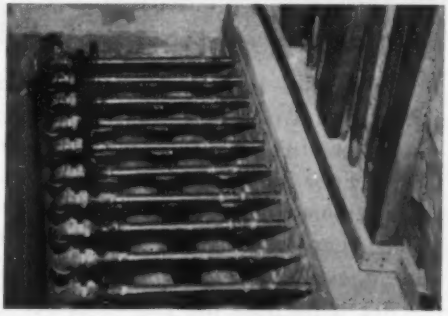


RAVENSWOOD
PRESBYTERIAN CHURCH
Chicago, Ill.

(Below-Top) Section of radiant panel heating system before concrete was poured. 16,500 ft. of ⅜"; 2,000 ft. of 1¼" and 1,500 ft. of 1½" Revere Copper Water Tube were used. Architect and Engineer, Benj. Franklin Olson; General Contractor, Harry C. Bjorklund & Son; Revere Distributor, The Davies Supply Co., all of Chicago. Harden Heating & Air Conditioning Co., of Elmwood Park, Ill., was Heating Contractor.

(Below-Bottom) Shows arrangement of balancing cocks on a return header. System was designed for zone control, a most important requirement for efficient operation in this type of edifice.

ANOTHER CASE OF *COPPER where it counts!*



CHURCHES, schools, colleges, municipal, office and similar buildings must be built to last. It's the only way to make them pay. That's why you'll find enduring materials like copper, brass and bronze used in so many places in so many of them.

The lasting quality of Revere Copper Water Tube was one of the reasons for its being used for the radiant panel heating system in the Ravenswood Church. Revere Copper Water Tube is non-rusting. It costs no more for workmen to install because its 60′ lengths are easy to bend and handle . . . it requires fewer fittings than rustable, short-lived materials. What joints are necessary are permanently soldered in a jiffy. That's why more and more architects, engineers, builders and contractors have been using it where it counts.

Although copper tube cannot now be used in civilian installations of radiant panel heating, we cite the Ravenswood Presbyterian Church to remind you of the merits of Revere Copper Water Tube over other materials so that when copper is once more permitted you will again use it. Meantime remember, you can still use Revere Copper Tube in underground service lines, domestic hot and cold water supply lines, industrial processing and for gas equipment.

Revere Copper Water Tube is available in hard and soft tempers in straight lengths; also in 60′ coils in soft temper. Each length is marked with the Revere name. Look for this mark. It assures you of uniform quality. These materials are available through your Revere Distributor, who will also put you in touch with Revere's Technical Advisory Service in the event you wish to discuss your technical problems.

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere

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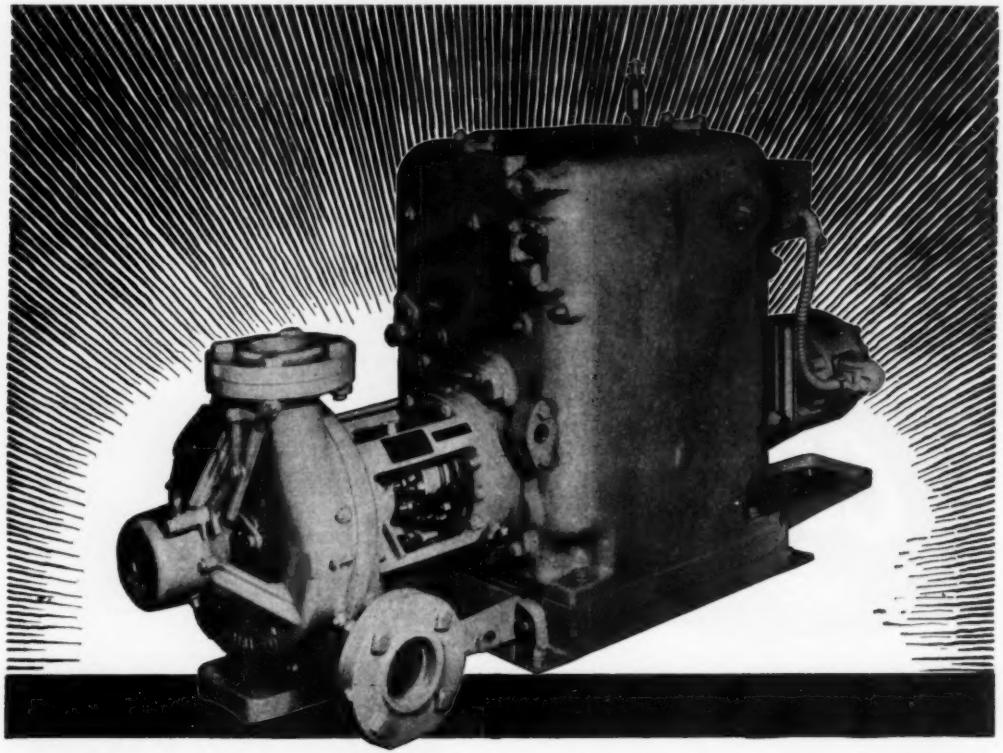
Safety!

THE NASH VAPOR TURBINE HEATING PUMP IS NOT STOPPED BY ELECTRIC CURRENT FAILURE



For service in greenhouses, hospitals, schools, theatres, and public buildings, where heat failure is a serious matter, the Nash Vapor Turbine Return Line Vacuum Heating pump should be specified, for this pump operates perfectly without electric current.

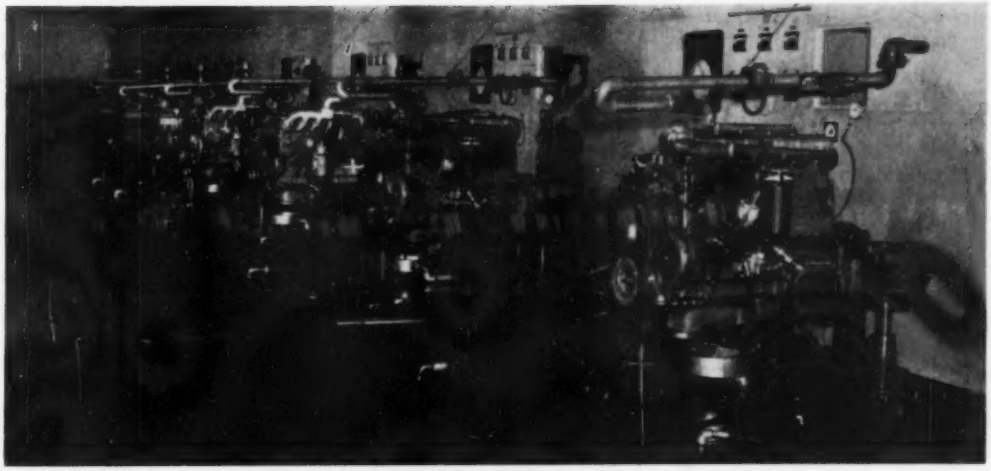
This is because the motive power is a special turbine operating on steam direct from the heating system. Steam used to drive the Vapor Turbine is returned to the system for heating, with little heat loss.

This pump insures constant heat in the system, it eliminates electric current cost, and it promotes high efficiency in the heating system. Heating efficiency is due to the fact that this pump can operate continuously with economy. Continuous operation means uniform circulation, and uniform conditions in the system mean steam saving.

This pump has but one moving part, no internal wearing parts, and requires no internal lubrication. Bulletin D-246 tells all about it, and it is free on request.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.



A TRENCH CONTAINS PIPING facilities for supplying engines on test with gasoline and diesel fuel, water and coolants and for recirculating filtered oil

Piping Promotes Production at Mack Truck Motor Plant

Piping for a wide variety of services is a vital part of the production and testing processes at the expanded and modernized International Plainfield Motor Co., subsidiary of Mack Trucks, Inc. A particularly interesting feature is the recovery of waste heat from engines on test, some 138,000 sq ft of floor space being heated by this scheme

THE COMPLETION OF a three year, multi-million dollar expansion program — to increase, modernize and consolidate manufacturing facilities — at the plant of the International Plainfield Motor Co., subsidiary of Mack Trucks, Inc., at Plainfield, N. J., was recently announced. This plant manufactures gasoline and diesel engines and automotive gear units for the world-famous Mack trucks, buses and fire apparatus. Piping for a wide variety of services is a vital part of the production and testing processes.

The program comprised five new structures — a three story administration and engine assembly building, an engine test building, an engine shipping and receiving building, a gear machining and gear unit assembly building and an engine head machining building — and the complete renovation and modernization of the heat treating building. The new additions increased the plant floor space from 400,000 to 700,000 sq ft.

The expanded and modernized facilities were planned and laid out by the company's production and plant engineering departments; the buildings, power facilities and mechanical construction work were designed, built and installed by the Wigton-Abbott Corp., Plainfield, N.J.

Ventilating the Dynamometer Corridors

Some unusual and unique features were incorporated in the design and construction of the mechanical processing facilities.

A highlight of the program was the engine test building, a one story concrete and steel mill type structure 100 ft by 265 ft with a 30 ft ceiling height. This building houses the equipment and services for 34 engine test stands and 44 engine inspection and adjusting stations, especially de-

signed to subject each Mack engine to the equivalent of a severe road test.

Twelve feet in from each sidewall is a 9 ft high steel partition running the entire length of the building and roofed over with steel deck. By this means a corridor is formed to enclose and separate the dynamometers from the engines on test. The corridors house the dynamometers and four motor generators. Each corridor is pressurized and ventilated with four 7500 cfm fan units, providing 64 air changes per hour. Each fan unit is incorporated in a sheet metal stack equipped with thermostatically controlled dampers for recirculating and tempering the air. Outdoor air is taken into the stack above roof level, tempered with the building air, passed through six 25 in. by 20 in. air filters, picked up by the fan and discharged into the dynamometer corridors.

The various controls, instruments, etc., for each test stand and dynamometer are flush mounted on the steel corridor partitions, facing the center of the building. The engines are mounted on pedestals outside the corridors, facing the center of the building and connected to the dynamometer by means of a Mack clutch and shaft through the steel corridor partition. The test stands are arranged in two banks, 17 on each side of the main room. Each is provided with a heavy steel base on which are mounted both engine and dynamometer. The bases are supported on cork blocks mounted on concrete foundations, isolating the stands from each other and preventing the transmission of vibration to the building.

The large central bay between the two rows of test stands houses such equipment as powered jib cranes, hoists, revolving motor stands, etc., for the dis-assembly of the 44 engines. Here each engine, after its running test, is given final adjustments and inspection prior to painting, crating and shipment to the Mack plant at Allentown, Pa., for installation in a truck, bus or fire apparatus.

Piping Gasoline, Oil To Test Stands

Gasoline and diesel oil are stored at a distance from the engine test building in underground tanks. Each type of fuel is piped and pressure fed independently to float controlled tanks mounted on the east wall. Pressure in the storage tanks and distribution system is maintained by a system which displaces the fuel in the storage tanks with water. From the float controlled, wall storage tanks the fuels are gravity fed to the individual test stands.

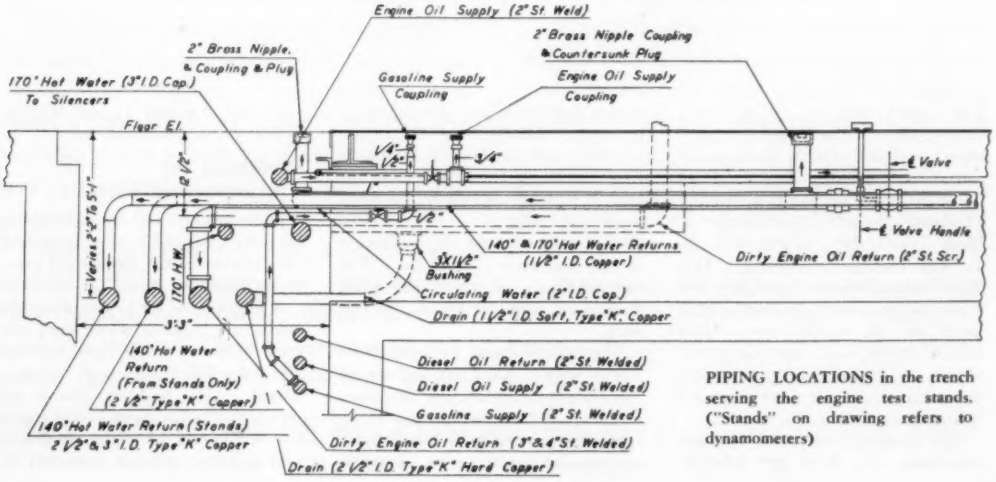
Keeping the Lube Oil Clean

During the test run some stray dirt, core sand and metal particles would inevitably be carried through the engines on test, with the consequent possibility of damage to running parts and the scoring of bearings, if the lubricating oil were recirculated within the engine. To guard against any such premature wear or damage, all engines are supplied with a large continuous flow of clean hot oil under 45 psi pressure to flush clean the engines and remove damaging particles. Oil discharged from the engines on test is piped (and flows by gravity) to a centralized 12,000 gal sump and make-up tank below the test room floor. It is then pumped by two 300 gpm pumps to an 8500 gal settling tank in a room above. This long horizontal steel tank is designed to allow 30 min settling at full flow to remove the heaviest particles and some moisture.

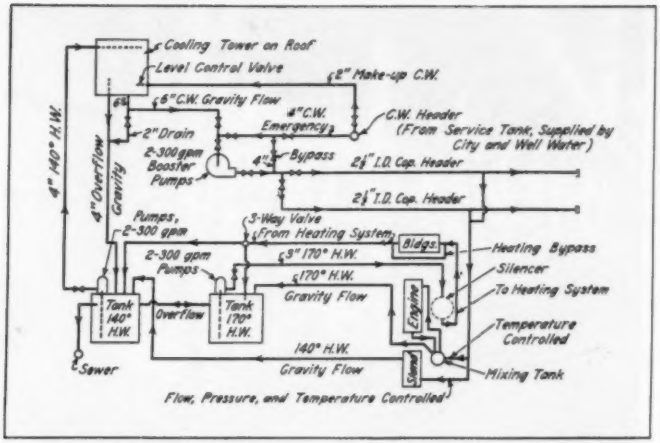
Partial centrifuging of the oil is accomplished by removing water from the first settling chamber (where most of it settles) at a rate of approximately 75 gpm with pumps, then passing it through a 180 kw electric heater which raises the oil temperature to 160 F for centrifuging.

Prior studies showed that proper purification and cleansing could be achieved without passing all of the oil through the centrifuges if proper settling and filtering facilities were incorporated in the system.

Three oil purifiers subject the lube oil to the dehydrating effects of centrifuging out water, dirt and other solids. The centrifuged clean oil next is then pumped back into the discharge chamber of the 8500 gal settling tank, joining the full flow of 300 gpm, through two pumps where


Engine Oil Supply (2" St. Weld)
2" Brass Nipple Coupling & Countersunk Plug
2" Brass Nipple, & Coupling & Plug
170° Hot Water (3" I.D. Cap.) To Silencers
Gasoline Supply Coupling
Engine Oil Supply Coupling
Floor El.
2 1/2"
Varies 2'3" to 5'4"
3/4"
℄ Valve
℄ Valve Handle
140° & 170° Hot Water Returns (1 1/2" I.D. Copper)
Dirty Engine Oil Return (2" St. Scr.)
3X1 1/2" Bushing
170° H.W.
Circulating Water (2" I.D. Cap.)
Drain (1 1/2" I.D. Soft, Type "K" Copper
3'3"
140° Hot Water Return (From Stands Only) (2 1/2" Type "K" Copper)
Diesel Oil Return (2" St. Welded)
Diesel Oil Supply (2" St. Welded)
Gasoline Supply (2" St. Welded)
140° Hot Water Return (Stands) 2 1/2" & 3" I.D. Type "K" Copper
Dirty Engine Oil Return (3" & 4" St. Welded)
Drain (2 1/2" I.D. Type "K" Hard Copper)

PIPING LOCATIONS in the trench serving the engine test stands. ("Stands" on drawing refers to dynamometers)



ENGINE COOLING water flow chart, showing only the principal control valves. "Stand" refers to dynamometer

the pressure is raised for forcing the oil through a bank of five multiple filters. There, colloidal carbon and any small particles of solids are removed. The filtered oil discharges into a supply tank and then is fed to the test stands by three 150 gpm centrifugal pumps. These pumps, together with a 1000 gal pressurized surge tank, deliver the correct volume of oil to the test stands at a constant pressure of 45 psi. In the event of a pressure drop, an alarm is sounded in the test room to warn the men to shut down all tests immediately. In case of fire, provision is made to dump all tanks automatically and stop all pumps and motors.

Providing Water for Cooling and Heating

Two 4300 gal concrete storage tanks beneath the test room floor provide a supply of water for cooling and heating. One tank, known as the 140 F tank, supplies the engines and inductor dynamometers. The other, known as the 170 F tank, supplies the hot water heating system. An induced draft cooling tower on the roof of the shipping building provides the means for cooling the water from the 140 F tank. Well water from the plant's wells makes up for the evaporation and other losses. Two 300 gpm deep well pumps raise the water from the 140 F tank to the cooling tower with ample pressure for spray cooling.

Two 300 gpm pumps receive the water from the cooling tower and supply the cooled water for each engine and inductor dynamometers through headers extending the full length of the dynamometer corridors. Water flow to the inductor dynamometers is automatically controlled to maintain an outlet temperature at or under 140 F after which this water is discharged into the 140 F tank. Engine cooling water temperature is controlled and maintained by circulation through a mixing tank at each test stand. The mixing tank temperature is maintained at 170 F by automatically tempering with the injection of cooling tower water, and expelling the surplus to the 170 F tank.

The exhaust gases from an engine, which approximate 1600 F in temperature, are passed through a water cooled combination heat exchanger and silencer beneath the floor at each test stand, where the sound is muffled and the heat transferred to the water for the heating system.

Waste Heat Helps Heat the Building

The large scale block testing of all production engines presents problems in the dissipation and absorption of the heat and power generated in the testing operations. Formerly, all engine exhaust gases were evacuated to the atmosphere with forced draft fans. To supplement the additional heating load that would be imposed upon the existing boiler plant by the new buildings, the combination heat exchangers were designed and installed to recover all available waste heat generated in a test run. Approximately 138,000 sq ft of floor space is now heated with this waste heat recovery method.

The hot water heating system is supplied by two 300 gpm deep well pumps which take the water from the 170 F tank and circulate it through the silencer heat exchangers at each test stand, where the water temperature is boosted to 210 F, and then on through the hot water heating system. To compensate for any water temperature drop, limited testing operations, and test room shut down periods, the heating system is provided with a 200 gpm heat exchanger.

Flow of water through the booster heat exchanger is controlled by a three-way automatic mixing valve. In the event the water leaving the headers fed by the silencer heat exchangers is not up to temperature, the three-way valve shunts all or partial flow, as required, through the booster heat exchanger to maintain a minimum 210 F temperature in the heating system supply. During the summer months, the hot water bypasses the heating system and is returned to the 140 F tank for subsequent cooling through the cooling tower. Building radiation is of the wall fin type.

The dynamometer testing of automotive engines consumes considerable starting current, but by the same token 19 d-c dynamometers will produce considerable electrical energy that either has to be dissipated or put to practical use. In the design and layout of the motor test electrical equipment, provision was made to recover the electrical energy generated by the dynamometer equipment. This energy, converted into a-c power, supplements and relieves the existing sources of power.

Improved Heat Treating Methods Used

In 1949, when the program was launched for the consolidation of the New Brunswick gear unit plant with the Plainfield engine plant, it was realized that many improvements had been made in the methods of heat treating and the handling of heat treated parts. Layouts were prepared and equipment purchased for conversion to the gas carburizing process. To suit the new equipment, the heat treat building was cleared of all former heat treating and quenching equipment and the entire building renovated.

Two automatic, radiant tube fired, tray type pusher carburizing furnaces were designed and fabricated. Each furnace forms a closed loop with a quench tank, washing machine and an air draw furnace so that the parts, after being loaded on the tray, are carburized, quenched, washed and drawn mechanically.

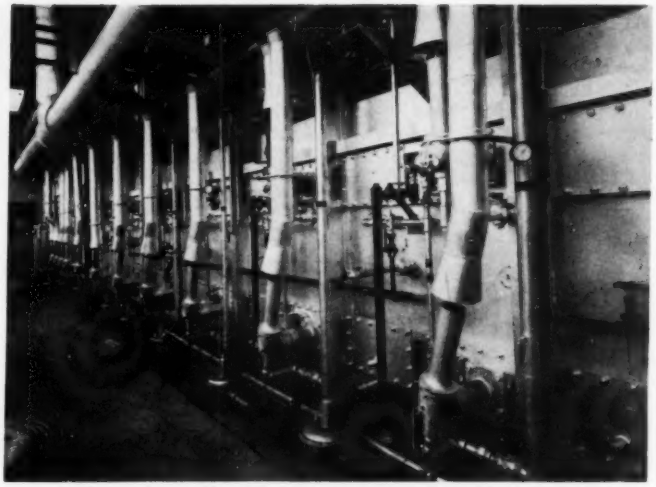
The exceptions to the above procedure are few, the deviation being that some of the carburized parts are either press- or arbor-quenched and then returned to the furnace tray to complete their treatment. At the present time, ring gears, bull gears, and sliding gears are press-quenched, while some clutches and differential bevel gears are quenched on arbors.

The major benefits are: (1) Better control and recording, resulting in scale-free surfaces and uniform depth of case and carbon content; (2) a minimum amount of distortion; (3) a diminished amount of die- and arbor-quenched work; (4) elimination of most "hot parts" handling; and (5) improved overall working conditions.

Immersion tube burners are located at the ends of the quench tanks which may be used for either heating or cooling, depending on the oil quenching temperature desired. Two heat exchangers, each with a capacity of 730,000 Btu per hr, were installed on a mezzanine over the oil sumps for cooling the quenching and furnace cooling oil to the desired temperature. Each furnace has a 30 hp turbine pump with a capacity of 500 gpm to pump the quenching oil from an oil sump, through the cooler, and thence to the quenching presses, the automatic quench tank and the furnace door seals, from which it returns by gravity to the oil sumps. The pumps are so piped and valved that only one standby pump unit is required for the two systems.

The atmosphere used for carburizing is a propane derivative prepared in two generators by catalytic cracking of a mixture of hydrocarbon gas and air (designated as "RX"). The furnace technicians check for propane gas leaks with an explosion meter every 8 hr in all low spots where the gas might collect and cause a fire.

Augmenting the carburizing furnaces are other furnaces used for hardening, reheating, cyaniding, and high and low drawing.



ONE OF THE AUTOMATIC continuous carburizing furnaces for newly-machined engine parts, showing the extensive exhaust and service piping

To conserve floor space in this area, reinforced concrete water and oil sumps were constructed under the floor and mezzanine above for a heat exchanger. This heat exchanger is unique in design in that it has two separate cooling systems — one for water cooling, with a capacity of 700,000 Btu per hr, and the other for oil cooling, with a capacity of 365,000 Btu per hr.

A flame hardening machine was installed for selective hardening of cam and bearing surfaces on camshafts. The burners are fired with a mixture of oxygen and propane, which gives such a hot flame that a shaft will reach a temperature of 1400 to 1500 F in less than a minute. The machine, fully automatic except for loading, has an electronic temperature control system and is capable of hardening 50 to 60 shafts per hour. To supply oxygen for this operation, a bank of 124, 150 lb cylinders, which also supplies oxygen to the cutting and salvaging departments, was installed.

Propane Storage and Vaporizing Plant

As gas carburizing is limited to the use of a uniform RX gas or equivalent with no sulphur content, it was necessary to install a propane liquid storage and vaporizing plant. This system consists of an 18,000 gal storage tank with the normal tank trim equipment, a compressor for unloading tank cars, and vaporizing and regulating equipment. This storage tank is above ground in a fenced off area, 100 ft from any building, where safety precautions are rigidly enforced. The liquid propane is piped from the bottom of the tank and fed through a steam heated vaporizer, then through a liquid trap, and on through a set of parallel regulators where the supply pressure is regulated. From the regulators, the gas is piped 1200 ft to the heat treat equipment. The storage tank is so located that propane can be unloaded either from a railroad tank car or from motor transport.

To meet the underwriters' requirements and also to safeguard the employees, safety shutoff valves are installed in the city gas fuel lines to shut off the gas supply in case of air or gas failure.

Wherever possible, all fumes and any spilled heat from open furnace doors and burner ejection discharges are exhausted through the roof to keep working conditions at a high standard. Centrifugal blowers were employed in the exhaust systems over all the pot furnaces where cyanide, lead and salt are used as the heating medium to assure positive exhausting.

The metallurgist, with his staff of trained technicians, has a chemical and physical laboratory at one end of the heat treat building where close control and quality are maintained.

The "Pimlico Scheme"

Hot Water from Battersea Power Station Heats Pimlico Housing Development on Other Side of River Thames

[Based on a personal interview by our correspondent in England with A. E. Margolis, head of the district heating department of Messrs. Kennedy & Donkin, consulting engineers, London. Mr. Margolis has been responsible for the design of many district heating plants on the continent of Europe, as well as the one here described.]

DISTRICT HEATING SCHEMES cannot be standardized, for conditions favorable to a project in one country may not necessarily apply in another. A. E. Margolis has argued for many years that the possibilities for development are greater in Britain than in the United States or in Europe and has shown that the load conditions for London are better than for New York, Hamburg or Moscow — even for a degree-day base for London of only 60 F as compared with 65 F for the other cities.

Heating installations in Britain are operated almost exclusively with low pressure hot water at moderate temperatures. Hot water can therefore be used with advantage for heat distribution in district plants. Turbines with very low back pressure are permissible and the heat and power loads can be balanced conveniently by hot water storage.

Without heat storage, the annual load factor of back pressure sets for district heat is only about half that of condensing sets, and the cost of attendance, maintenance and capital charges per unit generated is about twice as high. This perhaps is one of the reasons why only a small proportion — about 10 percent — of the total steam required for district heating in the United States is supplied by exhaust steam.

Favorable Circumstances for District Heating

At Pimlico, on the north bank of the Thames river near Westminster, the circumstances were exceptionally favorable for district heating. There was the compact 33 acre site, with a high heat load density, and a large existing electric generating station (Battersea power station) on the south side of the Thames almost opposite, *plus* a convenient under-river pipe tunnel with space available for additional mains!

THE HOT WATER ACCUMULATOR, with a heat storage capacity of 400 million Btu, installed on the Pimlico housing project (or "estate") site and which is supplied by under-the-river piping from the Battersea power station across the River Thames. (Photo by Colin Westwood)

The complete housing project at Pimlico will eventually grow to about 1640 dwelling units. There will also be a community center, nursery schools, day schools, public houses and shops. A church and two schools already stand on the site. Dolphin Square (1220 flats) and Russell House (74 flats), both adjacent to the Pimlico site, and 3200 future flats in Warwick Way will all eventually be supplied.

The total maximum heat demand will be about 80 million Btu per hr (based on a 35 F rise over the outdoor design temperature for the living rooms, a 30 F rise for the kitchens, bed and bathrooms, and domestic hot water at the rate of 15 gal per person per day at 130 F).

The scheme, in outline, consists of back pressure turbo-alternators at the power station, with heat exchangers, from which hot water is pumped in a closed circuit to a hot water accumulator on the Pimlico site. From the accumulator, the hot water is pumped as required to the flats. Hot water radiators are used for heating. Water for baths and basins is heated by independent exchangers (calorifiers) in each block of flats.

Two 1350 kw back pressure turbo-alternators are installed as additional house sets for the supply of auxiliary power in the station. (Steam pressure at the turbine stop valve is 600 psi at 800 F.) The sets are geared, with the turbine running at 10,000 rpm and generating three phase, 50 cycle power at 3300 volts. The exhaust heat output of each set at full load is 22.7 million Btu per hr with a back pressure of 2 psi gage. For the heat supply, two sets are sufficient because on cold days they can be run during 24 hr and the variation of load balanced by the hot water accumulator. In emergency, and as standby, live steam can be served to each heat exchanger through a reducing valve and a desuperheater. There is space for a third back pressure set when required.

The British Electricity Authority is responsible for the design, installation and operation of the plant in the power station.

The Flow and Return Piping

The design flow water temperature for transmission and distribution is 200 F, with a temperature drop of 70 F for the transmission mains and 60 F for the distribution mains. For the radiator circuits, the flow water temperature is reduced to 180 F by the admixture of return water with ejectors at each service point.

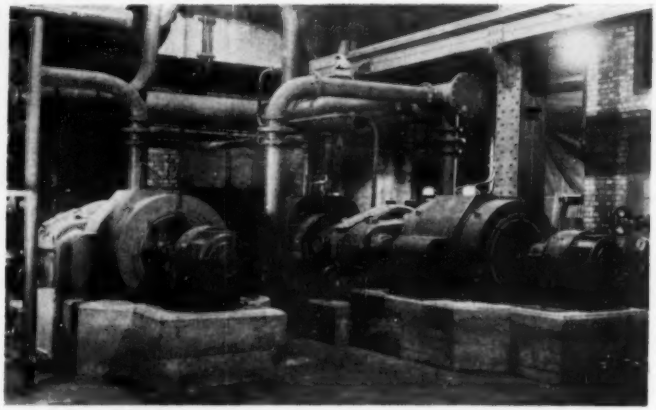
There are two main circulating pumps, each with a capacity of 46,000 gph against 44 ft total head. They are installed in the return main. When operating in parallel they can deliver 74,000 gph against 55 ft. A third pump of similar capacity may be installed later.

The return water passes first through a drain cooler and then through a heat exchanger to raise the temperature to 200 F, with thermostatic control according to the heating requirements. Condensate is cooled in the drain cooler to avoid evaporation losses and is re-used as feedwater without the need for deaeration.

The heat supply is metered at the boundary of the power station and, in addition, by duplicate steam meters for live steam to the turbines and for direct supply in emergency. There are indicators and recorders for heat, heating water quantity and for the flow and return water temperatures at the heat metering point — all arranged on the alternator control panel of the 3.3 kv board.

Under the Thames, the flow and return hot water transmission mains are of 12 in. bore and insulated by compressed cork sectional covering 2 in. thick. On the power station side of the river, the mains are butt welded; flanged joints are used in the tunnel.

The hot water accumulator is a mild steel cylindrical vessel, 29 ft diameter and 126 ft high, insulated with 3 in. cork. Water is stored at atmospheric pressure and is chemically treated. The useful heat storage capacity is about 400 million Btu at a temperature difference of 80 F. The accumulator also serves as an expansion tank for the total volume of water required for the heating system.



THE TWO 1350 KW back pressure turbo-alternators at the Battersea station. Hot water is pumped from their heat exchangers to the hot water accumulator on the Pimlico site. (Photo courtesy British Electricity Authority)

A STEEL PIPE main, 12¾ in. OD by 9/32 in. thick, conveys hot water from Battersea under the river for heating the Pimlico project. (Photo courtesy Stewarts and Lloyds, Ltd.)

Heating Is Thermostatically Controlled

Heat to the Pimlico housing project is thermostatically controlled by variation of flow water temperature. A mixing valve regulates the quantity of flow water from the power station or from the accumulator by an admixture of return water from the project's heating system. The correct setting of the thermostat is gaged from distance thermometers indicating and recording the air tempera-

ture in a number of typical living rooms. Temperature control at the adjacent Dolphin Square will be completely automatic and its supervision and control left in the hands of the operatives there.

Heating Water Colored To Identify It

All transmission and distribution mains have been tested hydraulically to twice the working pressure. Heat tests have also been made to observe the mains under operating conditions. The conduits have been constructed with drain channels which, in the event of a leakage, will indicate whether the trouble lies in the flow or in the return main. As a further precaution, the heating water is colored with fluoresceine to distinguish it from surface water.

To prevent flooding of the pump house basement, an electrically operated emergency stop valve for the accumulator will automatically isolate the hot water accumulator if there is an abnormal drop in its water level, or in the event of an exceptional rise of the water levels in the sumps, in the basement of the substation or in the Thames tunnel. Water level indicators with audible and visible signals are mounted on a separate control panel.

Will Save 10,000 Tons of Coal

On completion of the whole housing project, together with Dolphin Square, a population of about 10,000 will be served. About 10 million kwhr will be generated annually by the heat-electric plant, with an overall thermal efficiency for the generation of both heat and power of about 80 percent. Mr. Margolis estimates, too, that 10,000 tons of coal will be saved annually as compared with the fuel at present used at Dolphin Square plus the fuel which would have been used at Pimlico if the flats had been separately heated by coal fires, electricity or gas.

The scheme is now in operation with about half of the final load. It is a small beginning but of great significance for the future large scale development of district heating with heat-electric generation. It is believed to be the first district heating scheme in the world solely with exhaust heat supply. No live steam is required, either at the peak heating demand or for balancing the variations of the electricity and heating loads.

"QUOTE"

"One day about 15 years ago I suddenly came face to face with myself and realized there was something quite empty about my life.

"My friends and associates perhaps didn't see it. By the generally accepted standards, I was 'successful,' I was head of a prosperous manufacturing concern and I lead what is usually referred to as an 'active' life, both socially and in business.

"But it didn't seem to me to be adding up to anything.

"I began to wonder what to do. It occurred to me that I might have gotten myself too tightly wrapped up in my job, to the sacrifice of the basic but nonmaterialistic values of life. It struck me abruptly that I was being quite selfish, that my major interest in people was in what they meant to me, what they represented as business contacts, or employees, not what I might mean to them.

"I remembered that as my mother sent me to Sunday School as a boy, and encouraged me to sing in the church choir, she used to tell me that the value of what she called a good Christian background was in having something to tie to. I put in a little thought recalling the Golden Rule and some of the other first principles of Christianity. I began to get interested in YMCA work.

"It happened that just at this time we were having some bitter fights with the union at our plant. Then one day it occurred to me: what really is their point of view, and why? I began to see a basis for their suspicions, their often chip-on-shoulder point of view and I determined to do something about it.

"We endeavored to apply — literally apply — Christian principles to our dealings with employees, to practice, for example, something of the Golden Rule.

"The men's response, once they were convinced we were sincere, was remarkable.

"But I can speak with most authority on how this change of attitude affected me and my own personal outlook on life. Perhaps, again, many of my friends did not notice the difference.

"But I noticed it. That feeling of emptiness, into which I was pouring cocktails out of boredom, was filling up instead with a purpose; to live a full life with an awareness and an appreciation of other people. I do not pretend for a second that I have suddenly become a paragon. My faults are still legion and I know them.

"But it seems to me better to have a little religion and practice it than think piously and do nothing about it. I feel better adjusted, more mature than I ever have in my life before. I have no fear. I say this not boastfully but in all humility. The actual application of Christian principles has changed my life."—ALBERT J. NESBITT, President, John J. Nesbitt, Inc., in one of a series of statements presented by Edward R. Murrow over radio station WCAU.

RADIOACTIVE WASTE DISPOSAL PROBLEMS STUDIED

EXTENSIVE RESEARCH and experiments by universities and other cooperating units are under way to meet the problems of waste disposal, water supply, site selection and environmental sanitation, Joseph A. Lieberman, assistant sanitary engineer, Atomic Energy Commission, said last month at the spring convention of the American Society of Civil Engineers, New Orleans.

"It is felt that satisfactory progress has been made in dealing with sanitary engineering problems in the AEC and their relation to the general public," said Mr. Lieberman. He stated that the extent of development of the atomic energy industry, by government and private industry, "will be dependent, among other things, on how efficiently are solved the sanitary engineering problems bound to be associated with this growth."

INDIVIDUAL EXHAUST FANS, each of 1670 cfm capacity, take the air from the 12 work cubicles (six in each wing). This wall is of light "blowout" construction

Drug Company's Laboratory Ventilated for Safety

The new organic research laboratory described here by Frank L. Bonem has 12 work booths for experimental drug production, each with a blanket of air flowing across its open face to prevent outward flow of fumes, and each with its individual exhaust fan. Two 10,000 cfm units furnish the supply air through duct work. Outer walls of the cubicles are of light "blowout" type construction to minimize damage in case of an explosion

To INSURE SAFE and efficient preparation of drugs for medical research, a new laboratory complete with an automatic air handling system, explosion proof devices, and "blowout" type walls to protect lives and equipment has recently been completed and placed in operation by the Wm. S. Merrell Co., Cincinnati, one of the oldest U.S. pharmaceutical houses.

The building was designed by chemists L. Allen and M. G. Van Campen, Jr., together with Merrell engineer Rowland Kleine. The consulting engineers were Harold N. Hermann & Associates. The ventilation contractor was Henry Niemes, Inc. The general contractor was Frank Messer & Sons, Inc.

The U-shaped building is divided into two main parts — the administration and production areas. The administrative area houses the offices, raw material and finished product storage, and such service equipment as vacuum pumps, condensate return pumps, water heater, pressure reducing stations to keep plant steam and water supply at constant pressure, and two air handling units which are located on the outside, between the wings, but adjacent to the main building.

12 Booths for Experimental Production

The experimental production area consists of two parallel wings, each housing six work booths. Isolation of the wings from the main building is assured by a thick concrete block wall. The wings are isolated from each other by walls and a 16 ft space.

The 12 booths or cubicles in which the actual chemical reactions for drug production are carried on are each 5 ft deep and 5 ft wide. They are equipped with steam, compressed air, vacuum and distilled water lines, and electrical outlets. There is also a flexible 8 in. exhaust duct for direct application to working equipment.

A safety feature of these booths is their location and the construction of the outer walls. The booths are located on that side of each wing which is away from the other wing, and their outside walls are made of ¼ in. thick compressed asbestos panels, loosely fastened to the building columns. Concrete blocks form the inner walls. Due to this design, an explosion in any one work booth would blow the loose outer wall into the yard, away from any other building, and permit the gases to escape.

If an explosion should occur in one wing, production can continue in the other.

Ventilation System Removes Fumes

The prime function of the ventilation system is to carry away explosive and noxious fumes, and to prevent diffusion of such gases to other production areas in the building. This is of prime importance, for not only must the health of the personnel be safeguarded and explosions prevented, but cross-contamination cannot be tolerated.

The two air handling units, each of 10,000 cfm capacity, supply 100 percent outdoor, filtered and tempered air at a rate of 1670 cfm per booth, 1100 cfm being delivered directly in front of each booth through a fan shaped outlet and 570 cfm through a ceiling type diffuser outside the booth in the service corridor.

Each Cubicle Has Its Own Exhaust Fan

Each wing has its own air delivery system, which is fed by one of the two 10,000 cfm units. However, all cubicles have their own exhaust fans of above 1670 cfm capacity. These fans and their stacks are at ground level on the outsides of the booths. The 8 in. suction hose which is located in each booth is connected to the exhaust fan stack through the ¼ in. wall.

How the Ventilation Is Controlled

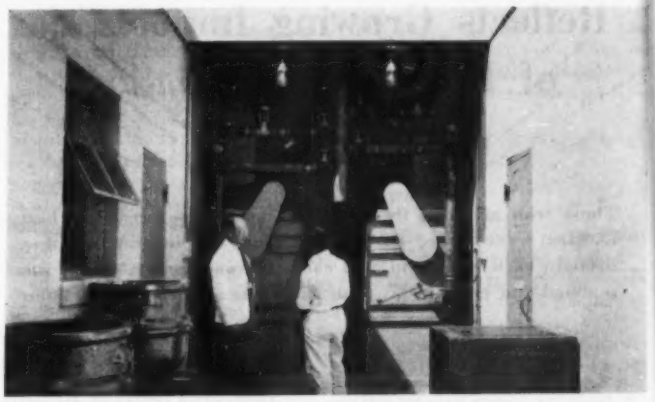
The air handling system is controlled automatically by pressure sensitive controls which maintain a blanket of fresh air in the corridor directly in front of each booth. Elements of the automatic system comprise electric motor controlled dampers in the air supply units and in the junction of the main and branch ducts in front of each booth, static pressure controls, and single multipurpose switches in each of the booths. Closing one of these switches in any of the booths will, in sequence, cause (1) the exhaust fan for that particular booth, and at least one other fan if no other booths are in use, to turn on; (2) open dampers in the ducts to direct air to the proper booth; and (3) start the motor in the supply unit if it is not already in operation.

Starting the exhaust fan first produces a slightly negative pressure in the booth. Consequently, when the supply fan is turned on, the supply air is sucked into the booth, thereby forming a curtain of air in front of it and preventing escape of fumes or gases.

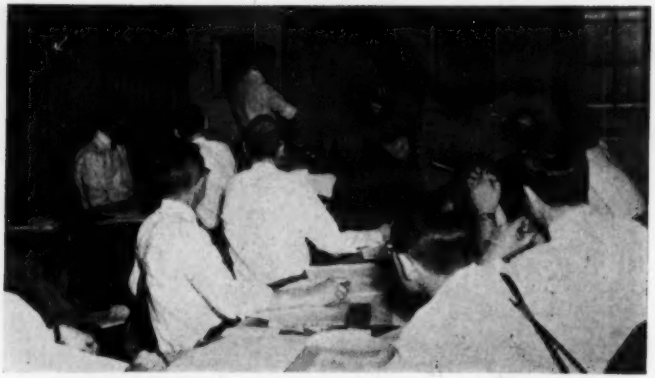
The static pressure controls sense the drop in pressure when an exhaust fan is turned on and will actuate motors that control the dampers in the main supply unit. Therefore, as additional booths are placed in operation and exhaust fans turned on, the resulting pressure drop will cause an increased supply from the main unit. Conversely, as a booth — and, therefore, the exhaust fan — is shut down, the pressure rise is sensed by the controls and dampers will close in the main unit to curtail the overall air supply to the whole wing. Thus, a constant positive air supply is at all times flowing from the outlets in front of the booths and in the corridor into the work areas and out to the atmosphere.

The supply air is filtered and tempered, as was mentioned, steam coils being used in the two 10,000 cfm units. Because the outdoor air make-up is 100 percent and a positive flow of air outward is assured at all times, humidification was felt to be unnecessary. To carry the additional heating load in winter, unit heaters are located at appropriate intervals in the two wings.

AIR IS SUPPLIED the individual cubicles through fan shaped outlets directly in front of them and through ceiling diffusers in the service corridor



100 PERCENT OUTDOOR AIR, tempered and filtered, is supplied each of the two laboratory wings by a 10,000 cfm air handling unit



Michigan State Conference Reflects Growing Importance of Industrial Ventilation

Those who attended the industrial health conference at East Lansing recently are enthusiastic about the information they brought back with them, and about the way the conference was planned and presented. John H. Clarke summarizes the affair

A FOUR-DAY INDUSTRIAL ventilation conference, jointly sponsored by the Division of Industrial Health of the Michigan Department of Health, and the School of Engineering of Michigan State College, was held on the campus at East Lansing, February 25-28.

Believed to be the first conference of this sort to be held in this country, it reflected the growing importance of industrial ventilation. The conference was attended by 110 engineers, chemists and industrial hygienists from 17 different states, was so enthusiastically received that it is expected that it will be placed on an annual basis. The conferees were most comfortably housed during their stay at Michigan State's new Kellogg Center, and were entertained during the evenings by talks on general subjects, movies and a banquet.

There was a lecture or demonstration period at each morning and afternoon session, followed in each case by a question and answer period and then class sessions during which the designs were worked out for two problems — a dust collection system and a fume removal system. These problems were based on actual installations which have proved successful, thus providing an excellent background for practical design.

Better Atmosphere Means Better Production

Dean of Engineering L. G. Miller presided at the first session, and John C. Soet, Acting Director, Division of Industrial Health, Michigan Department of Health, delivered the first lecture — *How Modern Manufacturing Affects Industrial Ventilation*. He pointed out that proper control of the industrial atmosphere will generally result in higher production, a higher quality product and lower maintenance. With respect to the systems necessary to provide the proper working conditions, he said that the *quality* of the air, and not the quantity, was of the greatest importance. The success of any industrial ventilation system depends upon the final results — the degree to which the contaminant concentrations in the workers' zones are reduced.

Mr. Soet also mentioned that contaminated air is probably responsible for more diseases than formerly thought possible, with the result that the present trend is to keep the toxic concentrations far enough below the present maximum allowable concentration (m.a.c.) limits to avoid irritating or uncomfortable conditions which might be sources of trouble.

It was pointed out that we have effective methods of measuring health hazards today, and are in a position to judge what correction is needed to provide safe conditions. The need for good health conditions for the efficient operation of industry has long been recognized. An example is provided by the slave trade of the 16th century; it was not uncommon for 50 to 90 percent of the slaves to die in the ship's holds. Ruthless as these slave traders were, they realized that it was an economic necessity to reduce this loss, and subsequent ventilation of the holds reduced the mortality rate to about 5 percent.

Control Must Be Engineered

In concluding his talk, Mr. Soet described the problems of a brass foundry, as an example of what can be done by careful study and design. In this case, the workers appeared to be developing lead poisoning and a real hazard from this contaminant was found to exist in the foundry. By curtaining the area of high concentration, by moving the air from the clean to the contaminated areas, by the judicious relocation of the existing equipment, and by the addition of make-up air, the concentration of lead fumes was reduced to a safe limit at modest cost. The change resulted in less sickness and absenteeism, high production and a higher quality product.

The second lecture of the morning session was *Control Must Be Engi-*

neered, by P. S. Hewitt, Director of Chemical Research, Reichold Chemicals, Inc. Mr. Hewitt emphasized, from the operator's viewpoint, the necessity for making a careful analysis of the problem confronting the industrial ventilation engineer. He pointed out that the following items should be carefully checked:

1) Contaminant concentrations.

2) Building location and type of building.

3) Initial operation of the installation to put it in working order and to see if it is doing the job. Operating checks should be made on a fixed schedule to assure that the system continues to provide safe working conditions.

4) In conjunction with Item 2, check to be sure that the system used to make one area safe will not contaminate another area.

Mr. Hewitt placed great emphasis on the fact that the equipment provided for the job must be practical to operate and easy to maintain, and that due consideration must be given in the design to the availability of adequate space and utilities for the installation. One cannot merely copy other similar systems and be sure that they will work — consequently, each problem should be studied and installed considering the specific job to be done and considering all of the check items previously mentioned.

Mr. Hewitt mentioned a case where his company had installed a fume removal system which had been copied in identical detail from a successful installation in another plant. But the "copy" didn't work. Investigation finally revealed the main cause of the trouble to be large outside truck doors which, when open, permitted excessive air velocities at the exhaust hoods — with resultant failure to keep the contaminant concentrations within safe limits. There were other differences which further emphasized the need for the engineer to make each solution fit the specific problem. It cost quite a bit to correct the system, and proper investigation might have avoided this loss. An installation that doesn't do the job is a loss and a wasted investment, he said.

Hood Design Principles Are Demonstrated

At the Monday afternoon session, K. E. Robinson, Consulting Ventilation Supervisor, and R. S. McClintock, District Engineer, Division of Industrial Health, Michigan Department of Health, demonstrated the *Principles of Hood Design* with hood models, exhaust fans and models of workers. The demonstration vividly indicated the necessity for keeping the hoods as close as possible to the work, the need to enclose the work as much as possible, the importance of being sure that the air flow is away from the worker and that no disturbing air currents are present which would cause unsafe working conditions. The improved air flow resulting from flanging and from the use of slot orifices was also shown.

Mr. Robinson warned again that the real problem in each case was to reduce the contaminant concentration to an acceptable point and that air quality rather than quantity was the important factor. He also mentioned the importance of make-up air and pointed out that it is more economical to provide and heat make-up air mechanically than to attempt to heat infiltrated air. He concluded by supporting the contention of the other speakers that the money spent on a system is wasted if a check is not made to be sure that contaminant control is obtained.

Evaluating Exhaust Systems

The morning session of the second day (at which Prof. A. B. Epple, of the University of Michigan, presided) was opened with a discussion on the *Evaluation of Exhaust Systems* by George M. Hama, Industrial Hygienist, Bureau of Industrial Hygiene, Detroit Department of Health. The aim of a good exhaust system is to provide conditions satisfactory for the comfort and health of the worker, he said. Maximum allowable concentrations are now available for a great many toxic materials. These m.a.c.'s are set low enough so that disease and illness will not occur in a worker even if he is exposed 8 hr a day for 20, 30 or even 50 years. He indicated that it sometimes takes many years of exposure before the effects of some contaminants show up. The point was made that a knowledge of industrial hygiene and proper equipment for testing is necessary for checking the operating conditions of an exhaust system to determine if the worker area is being maintained within safe limits. He displayed the principal instruments which are necessary for testing and explained their uses and limits:

1) The standard impinger, used for mineral dust exposure where the dust would exceed 5/10 of a micron in size, and for which the final reading is obtained from a laboratory microscopic count, which is converted to millions of particles per cubic foot of air.

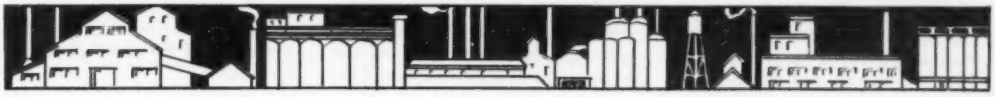
2) The electrostatic precipitator, used for small fume particles such as lead, zinc, etc., which are 100 percent removed by the precipitator, the measurement being in milligrams per cubic meter as determined by a laboratory analysis.

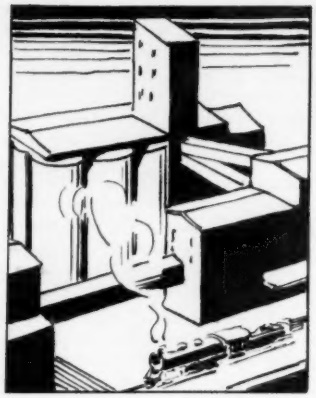
3) The carbon monoxide analyzer, a direct reading meter.

4) The halide meter, which is direct reading.

5) The combustible gas indicator, which also gives a direct reading. It is also used as an explosion meter, and provides a direct reading for combustible hydrocarbons in terms of percent of the lower explosive limit. Mr. Hama cautioned that the instrument could not indicate concentrations over the upper explosive limit.

Mr. Hama said that where instruments are not available for measuring the contaminant, it may be necessary for the hygienists and the chemists to work out an analytical method for the specific problem. In checking contaminants one must be careful to get representative samples, check the type of work being done by the employees, and the time of exposure in each area. Samples should then be taken in the working zones. Another method of sampling for checking lead, fluorine and similar exposures is by means of urine and blood analyses, and the best proce-





dure is to combine the biological tests with the air sampling tests.

Mr. Hama also presented a number of slides of various types of exhaust systems and discussed the relative merits of ventilating hoods where expensive solvents are used. He stated that by means of air sampling tests the correct air flow and best hood designs can be ascertained. He pointed out that over-ventilating can be very expensive because of the loss of solvents, for installations like solvent degreasers.

How to Design the Piping

For the Tuesday afternoon session, C. H. Pesterfield, Professor of Mechanical Engineering at Michigan State, gave a talk on *Piping Design*. He discussed the general principles of duct design and pointed out that square ducts and round ducts having the same hydraulic radius and velocity would have the same carrying capacity. Round ducts should be used for carrying solids and either round or rectangular ducts may be used for handling air, fumes or vapors.

Professor Pesterfield pointed out that the capture velocity is that velocity necessary to overcome the thermal or kinetic energy of a particle, and that the capture velocity could be from 50 to 2000 fpm — to which would have to be added additional velocity to overcome the effects of disturbing drafts of air in the space.

For designing balanced industrial exhaust systems, it was suggested that where the difference in the calculated friction at a junction (between a branch and the main or between two branches) is less than 5 percent, the unbalance be ignored; and where the unbalance is from 5 to 20 percent, the increased volume be estimated for the branch with the lower calculated friction. Where the unbalance exceeds 20 percent the duct size should be corrected to bring the frictions in agreement.

Correcting for Increased Cfm

For correcting for increased cfm, the increase may be estimated as follows:

Corrected cfm = Design cfm × [(Static pressure of run with larger static pressure loss)/(Static pressure of run with lower static pressure loss)]½

For correcting duct size, the new duct size = Initial duct size × [(Initial friction for run)/(Desired final friction for run)]⅛

The methods of calculating the complete duct systems including the hood entrance losses were discussed in detail. These methods followed the outline included in *Industrial Ventilation*, the manual used as a reference for this conference. [For those who have an interest in industrial ventilation this manual, published by the American Conference of Governmental Industrial Hygienists, is highly recommended. It is well written, authoritative, practical in scope and provided with many fine illustrations. It may be purchased from the Committee on Industrial Ventilation, P.O. Box 453, Lansing, Mich., for $3.00. It was reviewed in the March HPAC.]

Fan Uses and Limitations

At the morning session of the third day, (at which Dean Miller presided), Richard D. Madison, Research Engineer, the Buffalo Forge Co., spoke on *Fans — Their Uses and Limitations*. He reviewed the principal fan laws and then called attention to some of the things that must be kept in mind when selecting fans for industrial exhaust systems.

For instance, he said that for light dust loads the more efficient backward curved fan is preferred, but where dust loads are heavy, flanged paddle wheel fans should be provided. Where axial flow fans are used they should be operated over the hump of the capacity curve (the same as for a forward curved blade centrifugal fan) so that the fan will be operating in a stable area and the noise level will be at the minimum. For high pressure systems axial fans with large hubs should be used. For low pressures, small hubs may be used.

For all fans, it makes little difference whether the pressure losses are on the inlet or outlet of the fan if the system is designed for low pressure, he said. For high pressure systems, if the losses are on the inlet of the fan, the resulting reduction in air density will decrease the pressure capacity of the fan.

Mr. Madison mentioned that adequately sized inlet ducts should be provided on all fans to permit good flow to the fan inlet. Also, any tendency for the inlet air to rotate would reduce the fan efficiency and increase the noise level of the fan if the rotation was of opposite direction with respect to the wheel.

If fans are to be used in multiple operation, series operation will give good results if the fan curve intersects the system curve well back from the free delivery point. Parallel operation would be indicated where the fan and system curves intersect near the end of the curve (free delivery point). Mr. Madison mentioned injector systems and noted that they are expensive to operate because of the low efficiency and should be avoided if possible.

Conveying Solids With Fan Systems

In conveying solids with fan systems, allowance must be made for the material conveyed. The heavier the material and the larger the particle size, the greater will be the horsepower required for the fan, and the capacity will be correspondingly reduced. The increase in horsepower may be 25 percent or higher when passing material through the fan. Usual conveying practice would be in the range of ¼ to 1 lb of material per lb of air but the Germans have designed systems which conveyed 12 lb of material per lb of air. The pressure in such a system would be very high, but the system would be efficient.

Mr. Madison also reviewed some of the fundamentals of fan noise and mentioned that the present sound tests for rating fans permit a comparison of fans but do not provide a measure of the sound of the duct systems.

The third afternoon session was devoted to *Description, Application and Efficiencies of Collectors*, presented by John M. Kane, Manager, Dust Control Div., American Air Filter Co. Mr. Kane included a number of slides showing the major types of collectors and illustrating the principles of operation.

Mr. Kane emphasized that each type of collector had a specific field for which it should be used. He pointed out that the high capacity dust collectors used for industrial applications, where the dust count is in the vicinity of 100 to 500,000 grains of dust per cu ft of air, should not be confused with ventilation type filters which handle applications having from 1 to 4 grains of dust per cu ft of air. He mentioned the application of the low voltage, low capacity (high efficiency) electrostatic filters used for ventilation systems as compared with the high voltage, high capacity Cottrell type of collector. It was emphasized that the type of equipment used should depend upon the size and concentration of the dust particles. The measure of success for the system will be the amount of material escaping (mass rate of effluent) rather than the efficiency. In industrial work, the word "efficiency" has little meaning, he said.

Make-Up Air Supply of Great Importance

At the morning session of the fourth day (at which Dr. Albert E. Heustis, Commissioner, Michigan Department of Health, presided) Dean Miller spoke on *Air Supply — Its Importance and Economy*. He summarized some of the more important points of the preceding lectures with respect to the necessity of proper provision for make-up air.

He cited an example where carbon monoxide from heater flues was drawn into a working space because of the negative pressure existing as a result of insufficient make-up air. In a second example, in a linotype room, lead contamination and excessive CO concentrations resulted because no make-up air was provided and the exhaust system could not deliver the design volume. In addition, the middle of the room was hot while the areas near the windows were cold from the air infiltration at the windows. Adequate air supply corrected the situation. In a third case the exhaust air from a grinding machine drew lead fumes into the space from melting furnaces in another area. This difficulty was again chargeable to lack of proper make-up air.

Dean Miller re-emphasized the point made by other speakers that the proper provision for make-up air will not only result in more comfortable conditions for the workers because of the reduced infiltration, but it is more economical to heat the make-up air than to attempt to heat a building with the same amount of air leaking into the space or coming in unheated from other sources. Dean Miller pointed out that 100 percent make-up air is seldom needed in industrial systems because other supply sources that are acceptable usually exist. Also, it is possible to make use of the stray heat from equipment to heat the make-up air.

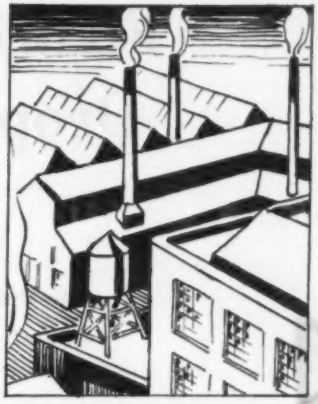
Air motion is also of great importance to the worker, so in designing the exhaust and supply systems the circulation and air movement through the space should be well planned. While it is possible to provide excess air or a deficiency of make-up air to decrease or increase infiltration, Dean Miller pointed out that it is not ordinarily possible to develop more than 0.25 in. of pressure in a building. It was also brought out that negative pressures resulting from lack of supply air not only draw fumes from space to space but also cause a safety hazard arising from the difficulty in opening doors.

The last session of the conference was the luncheon on Friday, at which the conference speakers acted as a panel for a question and answer period which was most informative to those in attendance.

Interesting Impressions of the Conference

Perhaps the most interesting impressions of the conference were the following:

1) The Michigan Department of Health and the Detroit Department of Health are very evidently interested in working earnestly with industry in arriving at practical solutions which will provide safety and reasonable conditions for the worker and economy for the owner. Perhaps too many governmental representatives make the mistake of being arbitrary and insistent on pet solutions or designs. It was evident that such is not the case in Michigan. They are always available for advice and help, but it was emphasized and re-emphasized that their main concern was with the results — not the manner in which they were achieved.



2) Industry could save a considerable amount of trouble, time and wasted investment by giving its industrial ventilation problems the same careful consideration that is given to process design. Usually the two should be worked out together.

3) One of the greatest values of such conferences is the exchange of ideas, problems and practices which always takes place when a group of engineers get together. This was especially true of this conference because of the excellent manner in which it was conducted.

ENLARGE COAL RESEARCH PROGRAM

EXECUTIVES OF THE COAL, railroad and allied industries supporting the program of Bituminous Coal Research, Inc., met recently in Chicago to learn of coal research progress and to chart a course for future research and development leading to increased coal markets.

Progress was reported on projects leading to the development of a coal-fired gas turbine for locomotive use, new continuous mining machines, and improved equipment for coal utilization. During the business meeting of sponsoring companies, the members authorized the BCR directors and staff to proceed with plans for an enlarged research and development program to expand coal sales.

Figuring Large Pressure Drops in Steam Piping

By Ben Briskin
Boddy-Benjamin Associates, Inc., Consulting Engineers

Where pressure drop is relatively small — as is the more usual case — the change in steam density is practically negligible. But with very long runs of pipe or large pressure drops, the change in density is appreciable and should not be ignored in calculations of flow and pressure drop

THE FORMULAS COMMONLY USED in determining pressure drop for steam flow through piping are those of Fritzsche and Unwin. They are based upon the pressure drop being a function of the pipe diameter, pipe length, mass flow of steam, and the density of the steam. To use these formulas correctly, the decrease of steam density which accompanies the pressure drop should be taken into account.

Symbols

A	=	transverse internal area of pipe, sq ft
C_u	=	a constant picked from table for use with Unwin formula
C_F	=	a constant picked from table for use with Fritzsche formula
d	=	inside pipe diameter, in.
k	=	exponent involved in adiabatic expansion
K.E.	=	kinetic energy, Btu per lb of steam
L	=	equivalent length, ft
P_a	=	average steam pressure, psia
P	=	steam pressure, psia
P_1	=	initial steam pressure, psia
P_2	=	final steam pressure, psia
v	=	specific volume, cu ft per lb
V	=	velocity, fpm
W	=	steam flow, lb per hr
y	=	density of steam, lb per cu ft
y_a	=	a constant picked from chart
psia	=	lb per sq in. absolute pressure

In the usual case, where pressure drop is relatively small, the change in steam density is practically negligible. But with very long runs of pipe or large rates of pressure drop, the change of density is appreciable and should not be ignored. One method of handling these cases is to compute the pressure drop for successive short lengths of pipe, correcting for the density in each section and then adding the individually calculated pressure losses. Another way is to guess at several average pressures and — perhaps by the aid of plotting — find the correct average pressure at which the density would give a friction drop equal to the difference of the final and initial pressures. Both these methods are indirect and somewhat cumbersome.

Taking Changing Steam Density Into Account

A much more direct method is to take the changing steam density directly into account in the formula. This may be done with the aid of a chart like the accompanying one, by which density is expressed in terms of average pressure.

Since the Unwin formula may be written as:

$$P_1 - P_2 = \frac{0.03628\left(1+\frac{3.6}{d}\right)}{10^6 d^5} \times \frac{LW^2}{y}$$

and the Fritzsche formula as:

$$P_1 - P_2 = \frac{0.21082}{10^6 d^{4.97}} \times \frac{LW^{1.85}}{y}$$

both may be put in the general form $P_1 - P_2 = X/y$, where X is the term involving pipe diameter, length of pipe and flow.

Let y = constant $\times P_a$.

Let constant = $2\ y_a$.

Since $P_a = [(P_1 + P_2)/2]$, then $y = 2y_a\ [(P_1 + P_2)/2]$ and $y = y_a\ (P_1 + P_2)$.

Substituting for y in the general form $P_1 - P_2 = X/[y_a\ (P_1 + P_2)]$ and $P_1^2 - P_2^2 = X/y_a$.

This last is the form which takes into account with the pressure drop the change of density.

If y_a were constant, the entire solution would be even simpler. However, a check of the steam tables shows that it varies. In spite of this, it will be shown that estimated values of y_a give results within slide rule accuracy, usually at first trial.

The values of y_a in the chart were determined from the relationship $y_a = y/(2\ P_a)$, where y was taken from the steam tables for various conditions at P_a.

By substituting for y in the original formulas they become as follows.

Unwin:

$$P_1^2 - P_2^2 = \frac{0.03628\left(1+\frac{3.6}{d}\right)}{10^6 d^5} \times \frac{LW^2}{y_a}$$

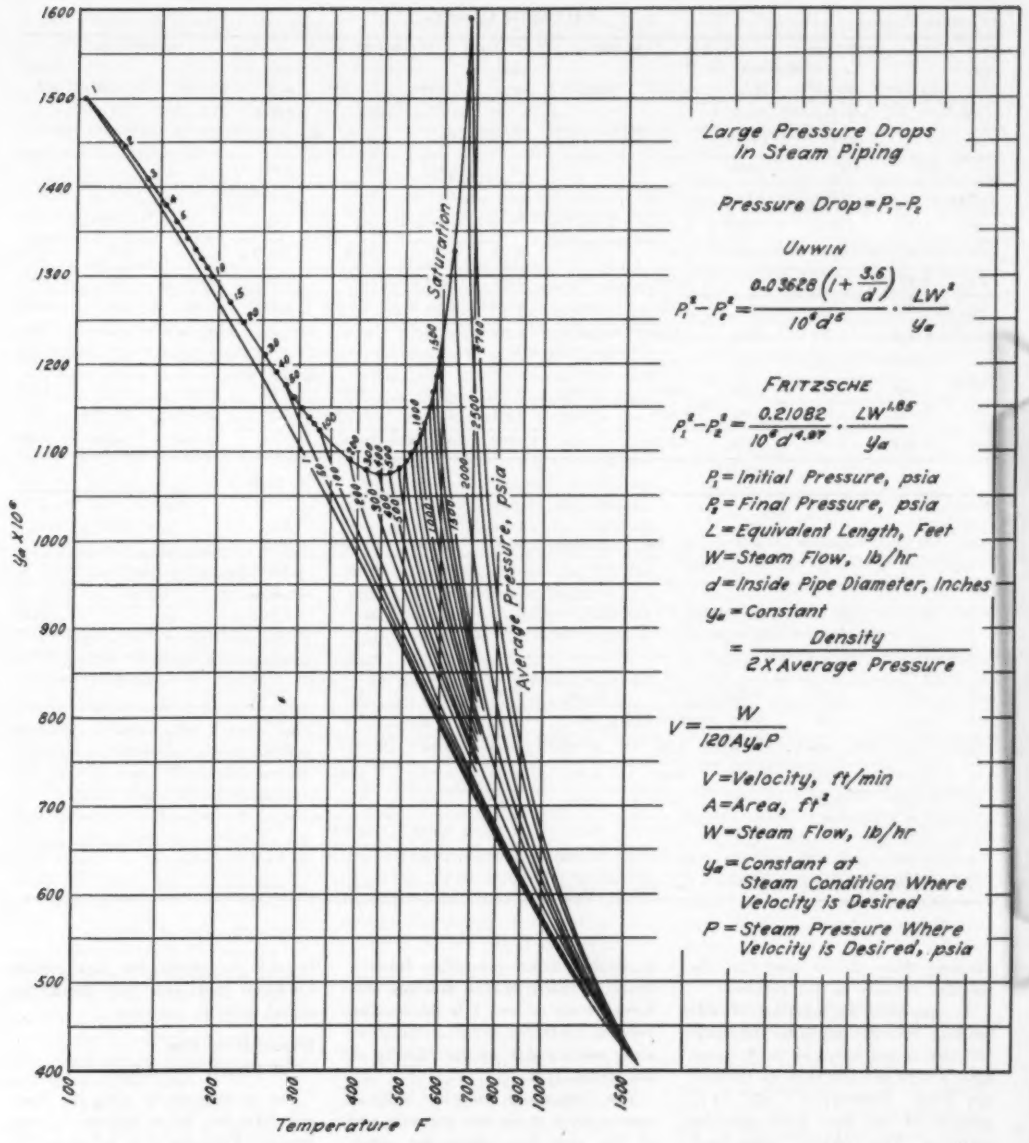
Fritzsche:

$$P_1^2 - P_2^2 = \frac{0.21082}{10^6 d^{4.97}} \times \frac{LW^{1.85}}{y_a}$$

As an additional aid to computation the first terms involving constants and pipe diameters have been tabulated for various sizes.

From the Unwin formula, let

$$C_u = \frac{0.03628\left(1+\frac{3.6}{d}\right)}{10^6 d^5}$$



Then

$$P_1^2 - P_2^2 = (C_u L W^2)/y_a \quad \ldots\ldots[1]$$

From the Fritzsche formula, let

$$C_F = 0.21082/(10^6 d^{4.97})$$

Then

$$P_1^2 - P_2^2 = (C_F L W^{1.85})/y_a \quad \ldots\ldots[2]$$

Also, for checking velocity it can be shown that

$$V = W/(120\ A\ y_a\ P) \quad \ldots\ldots[3]$$

where the constant y_a is chosen at pressure condition P.

Limitations to the Amount of Pressure Drop

In applying the above derived formulas, it should be realized that there are limitations to the amount of pressure drop which can be obtained in a steam pipe line. Without attempting to go too deeply into the theoretical aspects, the maximum possible pressure drop would normally be to a condition where acoustic velocity is reached. A comprehensive explanation of this phenomenon may be referred to in an article in HPAC in September 1936, entitled *How to Design Steam Piping for Maximum Capacity and High Pressure Drop*, by Max W. Benjamin. This velocity would be about 85,000 fpm or more, depending upon the steam condition. A check should always be made in cases of large

VALUES OF C_u and C_F

Nom. pipe size	SCHED. 40			SCHED. 60			SCHED. 80			SCHED. 100		
	$C_u \times 10^{12}$	$C_F \times 10^{12}$	Area, sq ft	$C_u \times 10^{12}$	$C_F \times 10^{12}$	Area, sq ft	$C_u \times 10^{12}$	$C_F \times 10^{12}$	Area, sq ft	$C_u \times 10^{12}$	$C_F \times 10^{12}$	Area, sq ft
2½	972	2362	0.0332				1365	3200	0.0294			
3	290	802	0.0513				397	1049	0.0459			
4	65.0	208	0.0884				85.8	256	0.0799			
5	19.0	67.6	0.1390				24.6	85.5	0.1263			
6	7.05	27.1	0.2006				9.29	35.0	0.1810			
8	1.63	6.93	0.3474	1.825	7.71	0.333	2.07	8.69	0.3171	2.37	9.84	0.302
10	0.488	2.24	0.547	0.564	2.56	0.519	0.624	2.82	0.499	0.726	3.22	0.473
12	0.1947	0.936	0.777	0.224	1.066	0.737	0.251	1.194	0.706	0.290	1.367	0.668
14	0.1186	0.586	0.940	0.1345	0.661	0.896	0.1531	0.745	0.852	0.1794	0.865	0.802
16	0.0593	0.301	1.227	0.0660	0.334	1.177	0.0755	0.379	1.118	0.0868	0.434	1.060
18	0.0328	0.167	1.553	0.0354	0.1841	1.496	0.0407	0.202	1.418	0.0469	0.241	1.342
20	0.01833	0.0981	1.931	0.0207	0.1096	1.842	0.0235	0.1236	1.755	0.0267	0.1399	1.670
24	0.00709	0.0389	2.792	0.00795	0.0435	2.670	0.00908	0.0494	2.536	0.01041	0.0566	2.405

Nom. pipe size	SCHED. 120			SCHED. 140			SCHED. 160		
	$C_u \times 10^{12}$	$C_F \times 10^{12}$	Area, sq ft	$C_u \times 10^{12}$	$C_F \times 10^{12}$	Area, sq ft	$C_u \times 10^{12}$	$C_F \times 10^{12}$	Area, sq ft
2½							2260	4980	0.0246
3							688	1725	0.0576
4	115.4	350	0.0717				154.8	456	0.0645
5	32.8	111.7	0.1136				44.6	148.3	0.1015
6	11.91	44.0	0.1650				16.34	58.7	0.1469
8	2.84	11.64	0.2819	3.27	13.27	0.2673	3.77	15.23	0.2532
10	0.828	3.68	0.448	0.998	4.39	0.418	1.163	5.07	0.394
12	0.537	1.438	0.630	0.382	1.773	0.601	0.461	2.12	0.559
14	0.200	0.957	0.769	0.237	1.127	0.721	0.274	1.291	0.683
16	0.100	0.498	1.004	0.1186	0.583	0.940	0.1312	0.641	0.904
18	0.0532	0.272	1.279	0.0619	0.313	1.207	0.0706	0.358	1.147
20	0.0310	0.1618	1.576	0.0361	0.1874	1.485	0.0407	0.209	1.418
24	0.01178	0.0658	2.292	0.01381	0.0743	2.155	0.01576	0.0847	2.048

pressure drop, to be sure that the acoustic velocity is not reached.

A simplified explanation of this limiting velocity might be to recognize that sound waves or shock waves have a very definite velocity through any fluid. Pressure is "felt" by a particle of the fluid from particles before it. This "feeling" is the shock wave travelling at its particular velocity. If the fluid particles reach the acoustic velocity, they can no longer be accelerated by means of the pressure behind them. Therefore, the limiting velocity would be acoustic velocity.

The formula for obtaining the limiting acoustic velocity is $V = 4086\ (kPv)^{1/2}$, where k is the exponent involved in adiabatic expansion, and may be obtained for a particular steam condition from a chart included in the Keenan and Keyes steam tables. v is the specific volume, cu ft per lb; P is the pressure, psia; and V is the velocity of the steam, fpm.

The maximum velocity will of course occur at the low pressure end of the pipe line where the steam specific volume is the greatest. The condition of the steam at the low pressure end of the pipe may be obtained by examining what has happened to the enthalpy of the high pressure end.

As the steam travels along the pipe, part of the initial enthalpy goes to kinetic energy in the moving steam and part goes off in the form of heat loss from the pipe. If these two are taken into account, then we should be able to obtain the final steam condition and with this check the actual velocity attained.

Example of Use of Chart, Formulas

For an example in using the chart and formulas, let us assume the following: Pipe size, 6 in. schedule 40; P_1, 100 psia, saturated steam; L, 1000 ft equivalent length; W, 30,000 lb per hr.

Find the final pressure, P_2.

The first step is to choose y_a.

Examination of y_a at various steam conditions will show that it remains practically constant for a constant enthalpy. Therefore we should be able to use the y_a corresponding to initial steam condition and correct later if it is found to be too inac-

curate. From the chart, at 100 psia for saturated steam, y_a is 1125×10^{-6}.

By Unwin:

$$P_1^2 - P_2^2 = (C_u LW^2) / y_a.$$

From table, for 6 in. schedule 40 pipe, $C_u = 7.05 \times 10^{-12}$.

$(100)^2 - P_2^2 = [7.05 \times 10^{-12} \times 1000 \times (30{,}000)^2]/1125 \times 10^{-6} = 6{,}345{,}000/1125.$

$P_2^2 = 10{,}000 - 5640 = 4360.$

$P_2 = 66$ psia.

To check if acoustic velocity might be reached, assume the "worst condition" of no heat loss from the pipe and ignore the kinetic energy.

y_a kept constant from the initial condition would be 1125×10^{-6}.

P at the low pressure end would equal 66 psia.

$V = W/(120\ Ay_a\ P)$.

$V = 30{,}000/(120 \times 0.2006 \times 1125 \times 10^{-6} \times 66)$.

$V = 16{,}500$ fpm.

This approximate velocity is still far from the limiting acoustic velocity and no further check need be made.

The same problem worked out by the Fritzsche formula would result in $P_2 = 72.8$ psia.

It is thus seen that there is disagreement between the Unwin and Fritzsche formulas by about 10 percent in this case. No recommendation is made here of which is the more accurate. However, it serves to show that if critical conditions are approached, a certain allowance should be made for inaccuracy of the formulas.

For a second example, assume a case where 100,000 lb per hr of steam is to be put through an 8 in. schedule 80 pipe, insulated, 8400 ft equivalent length, and 45 psia is desired at the low pressure end of the pipe. Find the required initial pressure of saturated steam.

If we assume a pressure drop of 100 psi and guess that y_a might remain approximately constant, then from the chart a tentative y_a at the 145 psia saturated initial condition would be $1110 \times 10.^{-6}$

By Unwin: $P_1^2 = [\ (C_u\ LW^2)/ y_a] + P_2^2$.

$P_1^2 = [(2.07 \times 10^{-12} \times 8400 \times 100{,}000^2)/(1110 \times 10^{-6})] + 2025.$

$P_1^2 = 157{,}000 + 2025 = 159{,}025.$

$P_1 = 399$ psia.

A corrected y_a at 399 psia would be $1080 \times 10.^{-6}$

To correct for y_a, we can go back to the above form of $P_1^2 = 157{,}000 + 2025$.

Corrected $P_1^2 = [157{,}000 \times (1110/1080)\ ] + 2025.$

$P_1^2 = 161{,}000 + 2025 = 163{,}025.$

$P_1 = 404$ psia.

It can be seen that choosing y_a at the original guess of 145 psia initial pressure affected the final answer by only about 1 percent.

To check the maximum velocity obtained at the low pressure end, we must obtain a closer approximation of the condition of the steam at this point. As explained above, the amount of enthalpy lost would have gone into heat losses from the pipe and into kinetic energy.

Heat loss from the 8 in. insulated pipe under the above conditions might be approximately 250 Btu per hr per ft of pipe, or for 8400 ft 2,100,000 Btu. At 100,000 lb per hr of steam, this would be 21 Btu per lb of steam loss in enthalpy.

Kinetic energy in terms of Btu per lb of steam would be as follows: $K.E. = (V/13{,}420)^2$

An approximate velocity may be obtained by assuming constant y_a.

$V = W/(120\ Ay_aP) = 100{,}000/(120 \times 0.3171 \times 1080 \times 10^{-6} \times 45)$

$V = 54{,}000$ fpm.

$K.E. = (54{,}000/13{,}420)^2 = 16$ Btu per lb of steam.

The approximate drop in enthalpy from the initial condition would be the sum of heat loss of 21 Btu per lb and kinetic energy of 16 Btu per lb, which is 37 Btu per lb of steam.

Initial enthalpy at 404 psia saturated steam is 1204 Btu per lb (from steam tables).

Final enthalpy would be 1204 — 37 = 1167 Btu per lb at 45 psia.

At this last steam condition, a check of the steam tables shows that the final condition would actually be slightly below saturation.

Thus the final velocity would be obtained from the formula $V = W/(120\ Ay_aP)$ by choosing y_a at 45 psia saturation and choosing P to be 45 psia.

$V = 100{,}000/(120 \times 0.3171 \times 1180 \times 10^{-6} \times 45)$.

$V = 49{,}500$ fpm.

If we wished to check the limiting acoustic velocity at the low pressure end it would be as follows:

$V = 4086\ (kPv)^{.1/2}$

k for 45 psia saturated steam = 1.315.

$P = 45$ psia.

$v = 9.4$ cu ft per lb.

$V = 4086\ (1.315 \times 45 \times 9.4)^{.1/2}$

$V = 96{,}500$ fpm.

Since the velocity of the steam does not approach this value, we know that the steam is at a practical condition.

If we wish to determine an additionally corrected initial pressure, taking into account the enthalpy drop due to heat losses and kinetic energy, we can choose y_a at average pressure and approximately at saturation.

$P_a = (404 + 45)\ /2 = 224.5$ psia.

$y_a = 1085 \times 10^{-6}$

Corrected $P_1^2 = [157{,}000 \times (1110/1085)\ ] + 2025.$

$P_1^2 = 161{,}000 + 2025.$

$P_1 = 404$ psia.

Therefore, the answer of 404 psia for the initial pressure is correct.

If we wish to check the above example by use of the Fritzsche formula, it would be as follows:

$P_1^2 = [(C_F LW^{1.85})/y_a] + P_2^2.$

$P_1^2 = [(8.69 \times 10^{-12} \times 8400 \times 100{,}000^{\ 1.85})/(1085 \times 10^{-6})] + 2025.$

$P_1^2 = 119{,}000 + 2025 = 121{,}025.$

$P_1 = 348$ psia.

It can be seen that the Fritzsche formula in this case gives a solution around 15 percent less than that given by Unwin. Again, no attempt is made to recommend one over the other but it is wise to provide for the worst and to leave a margin of safety.

NATURAL GAS RESERVES MAKE RECORD GAINS

PROVED RECOVERABLE natural gas reserves on December 31, 1951, totaled 193.8 trillion cu ft, an increase of 8.2 trillion feet over the estimated reserves a year earlier, according to a joint report of the committee on reserves of the American Gas Association and the American Petroleum Institute. These reserves climbed to a new record high level, scoring the second highest increase made since these estimates were started and were registered over an all-time high production of approximately 8.0 trillion cu ft of natural gas used during 1951. In 1950 the production of natural gas was 6.89 trillion cu ft.

Exploring the "Little Universe"

When on sabbatical leave, a professor of mechanical engineering may do all sorts of things — such as travelling around the world on a marine research project, visiting strange lands, extensive reading, and writing articles such as this. F. W. Hutchinson is now back on the job at the University of California. Kay Hutchinson did the sketches.

CHINESE PHYSIOLOGISTS — in times long past — thought of man as a "little universe", duplicating within his body many of the natural phenomena which are seen in the physical world. They pointed out that the world is habitable — and that man's body is habitable — only when there is a balance between heat and cold, between moisture and dryness, between rest and action.

In seeking the cause and cure of physical disorder or of mental discontent, their first efforts were to find an analogy between the condition of the patient and a comparable condition of the external world.

The center of the earth was correctly visualized as a storehouse of heat which gradually escapes through the earth's surface; the inner organs of man represented a similar thermal source from which body heat slowly escaped through the tissues to the skin and thence to the surrounding air.

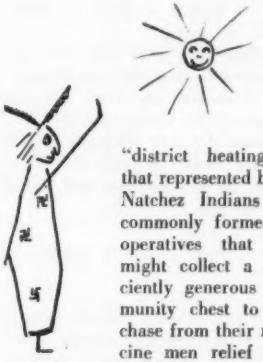
A volcanic eruption was regarded as a kind of emergency disposal of excess heat from the earth's core — just as the operation of the human sweat glands is an emergency mechanism for cooling the overheated human body. An earthquake served to shake the earth's "grate" and thereby stimulated the sluggish central "fire"; in similar fashion, the shivering that accompanies a chill

was pictured as a means of forcing the patient to undergo a form of involuntary exercise and thereby increase the body's rate of heat production.

The dry heat of a fever was considered damaging to the patient in the same way that the scorching desert drought prevents or limits the growth of vegetation. Just as a sluggish stream is more subject to contamination, so an inactive person is more subject to disease. A star without planets is a pariah of creation; a man without friends is a social outcast.

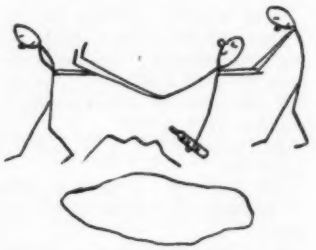
Man and His Environment

In the legends, the folklore and the magical practices of almost all primitive peoples there is an evident preoccupation with the relationship between man and his environment. In particular, the problem of warmth has been closely related in the mind of man with the associated problems of food and survival. In modern times, guaranteed thermal comfort is purchased at a predetermined price from the heating and air conditioning contractor. But in the past, warmth or relief from heat had to be bargained for — and without assurance of success — from the wizards or the witch doctors of the tribe. Probably one of the earliest attempts to secure



"district heating" is that represented by the Natchez Indians who commonly formed cooperatives that they might collect a sufficiently generous community chest to purchase from their medicine men relief from bad weather.

In Manipur, the Easter Angamis sought the equivalent of "air conditioning" by praying at the grave of a man who had been burned to death; their reasoning was that such a man — through personal knowledge of the discomfort due to excess temperature — would effectively intercede with the tribal gods to modify the weather. The Sulka of New Britain say that dehumidification is expected to follow the throwing of hot ashes into the air; since water does not like fire the natives reason that the ashes will intimidate the excess moisture and cause it to "run away" before it is painfully burned. In former times, Russian peasants sought relief from excess humidity by digging up the corpse of someone who had drunk himself to death and



throwing it into a lake or river; their reasoning was that the victim knew twice over — through both drink

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and drowning — the hazards of excess moisture and hence would be a convincing advocate in pleading their case before the gods.

Strangely enough, some of the magical rites used in the past to produce warmth and moisture still are found — though in vestigial form — in even the most modern centrally heated or air conditioned homes. For example, the Christmas tree formerly provided brands which when burned for 12 consecutive days provided warmth that presumably would prevent the family from getting chilblains for an entire year. Although the "operating cost" of this method of prevention was doubtless much less than that of a central heating system, there is reason to believe that a modern heating system maintains a higher record of anti-chilblain effectiveness. The Yule log has certain advantages, however, in that besides providing magical year 'round warmth, it also was believed to prevent vermin when placed under a bed, to indicate by the number of sparks discharged the number of chickens that would be grown during the year, to guard the house against lightning, and to protect the occupants against sorcery. Even in their most expansive moods, modern advertising copywriters have not yet been known to attribute to a convector or to a radiator these extra-curricular powers.

The Hazards of Imitative Magic

Among primitive peoples, one of the most inexpensive ways of attaining warmth is by means of imitative magic. If a small wax or clay image is made of the occupant and if the image is warmed, it is believed by some tribes that the occupant will no longer suffer from the cold. Unfortunately, however, this type of heating system is subject to severe disadvantage — since if controlled by an enemy the result of its operation may be disastrous to the occupant.

Thus, Hector Boece's *Chroniclis*

tells of Duffus, a Scotch king who perspired by night and was cold by day; investigation disclosed that a local witch placed a wax image of the king before the fire each night and exposed it to the cold each day. In modern terminology, the heating engineer might diagnose this difficulty as one in which the controls of the heating system were exposed to tampering by unauthorized operators!

The hazards of inadequate heating and of excess warmth were a subject of continuing interest to the ancients. Although their findings are hardly in accord with those of present day physiologists and engineers, they are nonetheless of interest. Burton, in *The Anatomy of Melancholy*, reports that heat produces mad men and cold produces witches. A high humidity is said to be good for developing one's memory, but has the disadvantage of making the occupants "dull and fat". Mild temperature and dry air cause people to be "merry but conceited". Jason Pratensis, a 16th century Dutch physician, wrote that the "temper of the ambient air" is responsible for the cause and can be used for the cure of "diseases of the head".

Curiously enough, some of the most technically accurate statements concerning the need for heating are found in the writings of a literary man. Thoreau, in *Walden*, says "The grand necessity then to keep the vital heat in us. What pains we accordingly take, not only with our food, and clothing, and shelter, but with our beds, which are our nightclothes, robbing the nests and breasts of birds to prepare this shelter within a shelter — by proper shelter and

clothing we legitimately retain our own internal heat; but with an excess of these, or of fuel, that is, with an external heat greater than our own internal, may not cookery properly be said to begin?" All of us will wholeheartedly agree with Thoreau that in feeling, if not in fact, a poorly designed heating system does lead to "cookery".

More Effective Than Ancient Rites

But interesting and entertaining though the beliefs and practices of our predecessors may be, it is nonetheless satisfying to know that in the modern world the problems of indoor comfort can be solved more effectively and more economically than by use of magical rites. To the layman the methods used by air conditioning and heating engineers may retain some of the aspects of magic, but it is a magic deriving from reason, from skill, and from practical experience. A well-designed modern heating or air conditioning system accomplishes its purpose so quietly, so continuously, and so inconspicuously that, like a good servant, it is rarely seen or heard. Whatever the other uncertainties of the atomic age may be it has, at least, enabled modern man — the "little universe" — to maintain the balance between heat and cold, between moisture and dryness, and to do so in his home or office or workshop with uniformity, with precise control and with surprising economy.

PREDICTS $5 BILLION AIR CONDITIONING ANNUALLY

AIR CONDITIONING — which is celebrating its 50th anniversary this year — achieved the status of a billion dollar industry in 1951, Cloud Wampler, president of Carrier Corp., said at a luncheon meeting of stockholders held at the Waldorf-Astoria, New York City, and commemorating the first air conditioning installation by Dr. Willis H. Carrier.

He predicted that the next half century will see the industry increase at least five-fold to reach a volume of $5 billion annually.

"It is the pressure of competition, the spur to greater productivity and employee efficiency, which today is creating a vast market for air conditioning in multi-story buildings, in commerce and in industry," he said. "The day will come when people will no more think of tolerating the discomforts of summer heat in their homes than they now tolerate the cold of winter," he predicted.

How To Make Cost Analysis of Heating Plant Operation

By L. C. Hardison, Mechanical Engineer, and W. J. Parduhn, Superintendent
Department of Buildings and Grounds
Illinois Institute of Technology

Economical operation of a heating plant requires regular analysis of costs to assure that the owner is getting the maximum return on his investment and that his money is not being wasted. The engineer charged with supervision of the plant must use a cost accounting method that is as simple and as quick as possible, for he has many other duties. One such method, used at a particular plant, is discussed here . . . . . This paper was originally planned as an article for HPAC to follow-up an earlier one published in our August 1951 issue. It was later decided to present it at the first annual meeting of the American Power Conference, which was held last month

EVERY ADULT HAS TO account for something or other occasionally, and engineers are certainly no exception to this rule. In particular, an engineer charged with the economical operation of a heating plant is held accountable for a great many things.

A man who is hired to supervise operation of a heating plant should not allow himself to be overburdened with paper work to the point where he is no longer an engineer — although this can happen very easily. It is necessary, then, that the "accounting" be done as simply and quickly as possible, without sacrificing any of the necessary elements of a good cost system. This problem of doing cost work in a minimum of time has, of course, many possible solutions. This paper deals with one such solution, used at one particular plant.

A few comments on the plant are in order, for it should be understood that a financial system must be "tailored" to fit the particular heating installation if it is to provide satisfactory results.

Brief Description of Plant Referred To

The boiler in question was completed in 1949, at which time underground piping was extended to serve some 38 buildings operated by Illinois Institute of Technology. The new plant consists of a single 60,000 lb per hr pulverized coal and gas fired boiler, which replaced two oil fired units of undetermined age with a combined output of about 30,000 lb per hr. These units are still used for standby operation and will continue to be used for several years until an addition to the new plant makes them unnecessary. Steam sent out from the new plant is measured by an integrating steam flow meter, and condensate meters in every building provide steam consumption figures. Over a mile of prefabricated steam line delivers steam to a maximum distance of ⅝ mile. The total volume of campus buildings is 10.5 million cu ft, and is increasing rapidly with new construction. The completed building volume is estimated at 23 million cu ft in 1960.

The plant burns carbon coals and screenings which cost about $2.50 plus $3.20 per ton freight, and run 11,500 Btu per lb. Eleven men are employed for operation, with one engineer and one fireman on duty 24 hr per day, in addition to the chief engineer and a part time coal passer. Electricity is purchased at $1.70 per kw plus $0.007 per kwhr from the campus electrical system. Feedwater is treated with a combination hydrogen and sodium zeolite process. For purposes of this discussion, the rather controversial question of plant depreciation will be omitted, but it might be noted that, if included, total amortization of the investment would run around $60,000 per year.

[An article in the August 1951 HPAC gave complete details of this heating plant and its growth.]

Aims of the "Financial System"

The problem is to set up a complete financial system for the plant, as it stands. Such a system has three primary purposes:

1) To distribute the costs of operation among the various users of heating steam.

2) To discourage as far as possible excessive use of heating steam.

3) To provide an incentive for the most economical operation possible, and make uneconomical operation obvious.

Methods of Charging for Heating Steam

The core of any such financial system is the method of charging for heating steam. There are several types of charges in common use today, which may be classified in very general terms as follows:

1) The "utility" type rate. Usually this rate provides that consumption be charged for at a rate that decreases per unit consumption as the consumption increases.

2) The "utility" type with a demand charge as well as a consumption charge.

3) The flat charge or assessment against all "customers", which means that each building is charged a fixed amount determined by the size of the building or some similar characteristic, without regard to the actual consumption.

4) The "percent of costs" method, where each consumer is charged a percentage of the operating costs based on his percentage of the total steam used.

5) The flat price per unit of consumption.

The choice of a rate on the basis of the three criteria listed is not difficult. The first rate encourages consumption of steam. That is, it costs the consumer only a little more if his building is uneconomically heated. This is a desirable situation for the business that sells steam for profit, but it is definitely undesirable for a company that sells steam to its own branches.

The second rate has this same shortcoming, plus an additional one. The economically heated building, with temperature control, night shutoff, non-opening windows, and so on will reach a maximum steam consumption determined by the capacity of its radiators — if they are properly designed. If the building had no temperature control, night shutoff and open windows in warm weather, it would reach the same maximum, although it used a larger total amount of steam for the year. The demand charge of each would be the same, with no penalty against the excessive user.

The third rate — the flat assessment — is even less desirable from the point of view that it encourages consumption.

The "percent of costs" method is the one which appears the easiest to use from the standpoint of the engineer. There are two reasons for not using it. First, an excessive user will have to pay for only a small part of the excess expense he brings about, and second, the plant always "breaks even" for the month or the year. There can be no profit or loss on the plant books, which eliminates a large factor of incentive for economical operation of the plant. This is perhaps the most undesirable method.

Flat Price per Unit of Consumption

The flat price per unit of consumption is, in the opinion of the authors, the most desirable for this type of operation, and it is the one used by I. I. T.

The establishment of this rate requires careful estimates of fuel, labor and other costs for each new year, but it will suffice here to say that this can be done with reasonable accuracy even without previous experience in operating the plant in question. In the case of I. I. T., it is sufficient to say that this charge was set at $0.95 per 1000 lb of steam sold this coming year, based on a figure of 124 million lb total production, 28 million lb loss or unaccounted for and $91,000 expenditures. These figures were determined on the basis of experience during last year's operation. They can be determined using steam consumption tables and data given in the National District Heating Association's District Heating Handbook, re-issued last year.

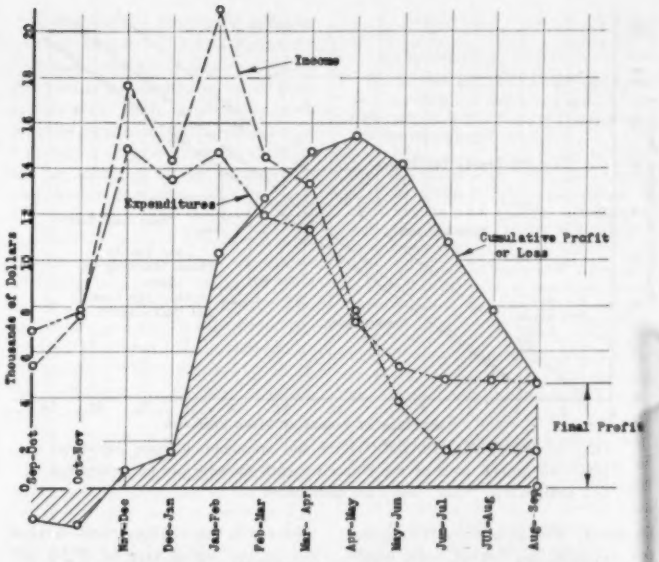


FIG. 1—FINANCIAL DATA for the plant during 1950-51. Income and expenditures often appear to vary erratically, and it is difficult to predict the accumulated profit or loss for the plant until late in the season

Graphical Accounting Supplies the Answers

A rate similar to this was used last year for the same plant. The resulting income and expense figures are shown in Fig. 1. The financial data are taken from expense statements supplied by the I. I. T. accounting department. As it can be seen, the income curve had roughly the same shape as the expenditure curve. Costs per thousand ran very high in the summer, and very low in the winter, causing the plant to run a considerable deficit in the warm months and quite a profit in the cold ones. It was difficult early in the fiscal year to tell just where the final profit or loss figure would be, and — without further figures — to tell why it would be there. For this reason the graphical cost accounting program was instituted, which has successfully answered such questions as were posed by the variation of unit costs. The system is based on several charts which will be developed here. The reasons for the procedure used in making these charts will be illustrated by examples of their use.

Fig. 2 is shown as a preliminary step, and actually has no part in the analysis proper. It shows the steam consumption and production as a function of the number of degree days during the fiscal month for the first months of the year starting September 20, 1951. A very simple point is illustrated — that the steam consumption is very nearly proportional to the number of degree days. In addition, it is shown that the production and line losses are also reasonably proportional to the number of degree days. The chart was plotted from actual meter readings and the degree day records of the U. S. weather station in Chicago. If steam production figures are not available, it is possible to predict these curves, but with only fair accuracy. Once the principle of linearity is established, the data are required for only a few months.

No Theoretical Basis for Plant Output

The reason for setting up Fig. 2 is this: *No theoretical basis for the output of a heating plant can be de-*

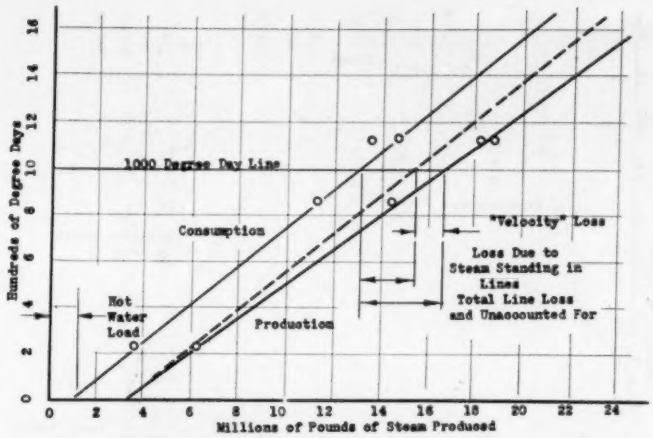


FIG. 2—MONTHLY PRODUCTION and consumption since September 1951. In general most of the points for each quantity can be represented by a straight line. Other points are disregarded

termined. For an automotive engine, for example, the Carnot cycle establishes a theoretical efficiency which cannot be exceeded, and it serves as a measure of the "perfectness" of the engine. The perfect heating installation, however, would be one that did not exist — for all of the system losses including the building heat loss can theoretically be reduced to zero. The "perfect" installation would have no output for, after all, the heating plant does no more than supply heat to replace losses. For this reason, all of the points which show a marked deviation from the norm are disregarded, and a curve drawn through the rest. The resulting line shown in Fig. 2 sets up a practical guide for estimating output. The reasons for the deviations of points from this line will be discussed later.

Developing the Monthly Analysis Chart

Fig. 3 is another chart which is of particular value in cost analysis. The curves are drawn in this order. First, the assumption is made that no steam is lost or unaccounted for, or that all of the steam send-out is metered in the buildings, and charged for at the stated rate of $0.95 per 1000 lb. On the basis of this assumption, a line showing income vs. production can be drawn. This line is labeled "0 Loss /Mo" in Fig. 3. Were the line losses 1 million lb per month, regardless of production, the income would be given by a second line, parallel to the first, but to the right of it. The same process could be repeated for 2, 3 and 4 million lb loss.

The second step requires reference to Fig. 2. From this chart, it can be seen that the normal value of line loss can be determined for any given production. Assume some production and determine the line loss that is normal for this production. On Fig. 3, place a point at this production figure, and at the proper distance up for the line loss found to fall along an income line representing the normal loss for this production. Repeat this same procedure for several different production figures, and it will be seen that these points all fall on a straight line, and that this line gives the income at any production, if line losses are normal.

TABLE 1—DATA FOR drawing expense curve in Fig. 3

Item	Constant (per month)	Proportional to production (per 1000 lb)	
Labor	$3159		Based on schedule
Fuel		$0.333	Computed at 84% eff.
Maintenance	$ 30	$0.0040	Estimated
Ash handling		$0.0146	Determined last year
Feedwater		$0.0070	Computed
Electricity	$ 300	$0.0250	Determined last year
Totals	$3509	$0.3836	

Here, one other piece of useful information can be incorporated into the chart. It was shown that the production was proportional to the number of degree days under normal conditions. A degree day scale can therefore be added at the bottom of the chart parallel to the production scale. This can most easily be drawn by marking of the zero degree day point and another one, say, at 1000 degree days, and then dividing this range into 10 parts and extending it. Now, for any number of degree days during the month, a "normal" income figure can be determined.

The reader should not find great difficulty in convincing himself that if actual income is not equal very nearly to the predicted normal income for a month with, say, 1000 degree days, something is wrong with the system. Line losses may be too high, which would give an income too low, or consumption may be excessive, which would show too high an income.

Now it is desirable to go further in this same direction, by adding curves showing "normal" operating expenses vs. production (and, therefore, also vs. degree days per month). Fig. 3 shows one such curve. The data for this expense curve is shown in Table 1. The curve is drawn on the basis of the best available estimate of what it actually costs to operate the plant under "good" conditions. Each item of cost is taken as a straight line function of the total production of steam, an assumption that has been found perfectly good for purposes of this analysis.

Certain comments on the figures in Table 1 should be made. It should be noted that the fuel cost was taken at a constant efficiency of 84 percent. This efficiency will not always be maintained. It is desired that any operation at *lower* efficiency show up as a loss, and *higher* efficiency as a profit, regardless of the time at which it occurs during the year. The same is true of the labor costs, which will be exceeded during "holiday" months, and vacation periods.

Adding one more set of lines to Fig. 3 produces the final monthly chart shown in Fig. 3. These broken lines give a cost per 1000 lb produced, and each is drawn by merely assuming a cost of, say, $0.60 per 1000 lb at 10 million lb production

and drawing a line that goes through the origin and the $6000, 10 million lb point.

At Illinois Tech, this chart is used 12 times during the year. A new chart need be drawn only if one of the variables, such as building volume or fuel cost, changes. In these cases, it usually will be sufficient to add a line to the chart as a revision rather than to have it redrawn. The construction of the chart is in any case a relatively rapid procedure, for all of the lines are straight, and each requires only two known points.

Use of the Monthly Analysis Chart

Two examples of the use of this chart will be considered to illustrate the general method of analysis. The data assumed here are "fictitious" in that they do not represent the actual operation of the plant. The figures used were chosen in such a way that the analysis would be simple enough for easy presentation, rather than indicative of the actual financial status of the I. I. T. plant.

For the first example, assume:

1) "Normal" degree days 300
2) Actual degree days 200
3) Production ..... 6 million lb
4) Expenditures $4900
5) Income $5500

These figures are easily obtained for any month. The first figure, the "normal" number of degree days for the particular month, is taken from a summary sheet printed by each weather bureau station. The actual number of degree days is obtained on the morning of the first day of each month for the period just ending, by calling the weather bureau information service. Production and expenses are taken from a simple operating data card turned in each month by the chief engineer. The last figure comes directly from the total of all steam bills prepared for the month. The collection of all of this information seldom requires more than a few minutes.

The analysis of the data is made in the following order.

1) Without reference to any other data, draw a line corresponding to the normal number of degree days, as shown in Fig. 4, if this has not already been done. The intersection of this line with the "expense" and "income" lines give the best future estimates of cost and income that can be made. These figures are $5100 and $4600 for 7.4 million lb production. Mark these points for reference.

2) Disregarding all other data, erect a vertical line corresponding to the number of degree days occurring during the month. Successive points lying along this line will give the following figures:

a) Production ..... 6 million lb
b) Income $5500
c) Line loss ..... 2.3 million lb
d) Expenses $4900

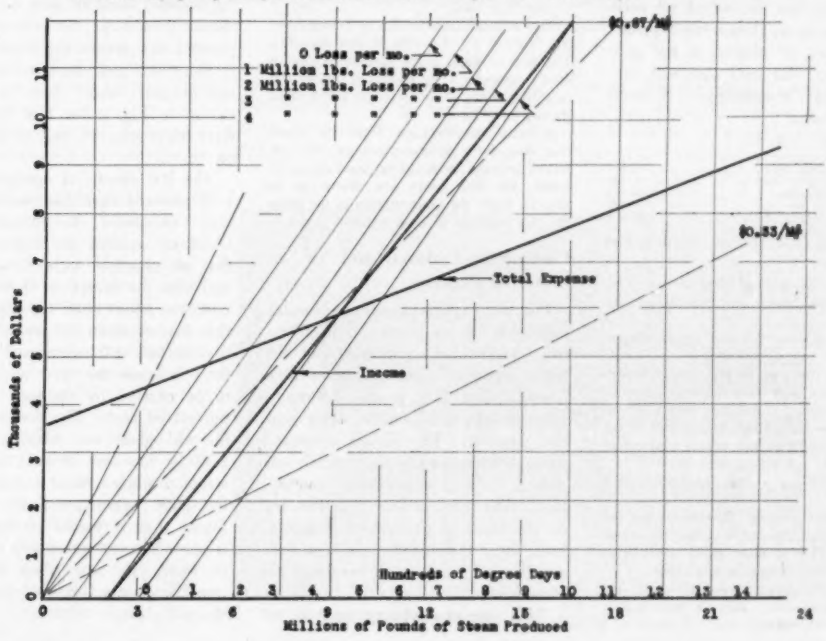
All of these are based on the assumption that operation is "good" — that is, that there are no excessive expenditures and no over-consumption of steam.

3) Check these figures point by point, with the actual case. For this case, all of these figures check as closely as the chart can be read. Circle each point to note the fact that actual and expected figures coincide.

4) "Account" for every case where there is more than one point to represent a single quantity. For instance, there are two "income" points shown; one for the "normal" month, and a lower figure for the "actual" month. All of the difference can be accounted for by the fact that the weather was warmer than normal.

A report on costs written for this imaginary month would indicate that, while the best previous estimate of income and expenditures indicated a net loss of $500, the actual loss was $1400. This $900 difference in these two figures was accounted for only by the warmer weather this month, as all operating expenses were normal. The $900 deficit will be carried on the books and show up as a loss at the end of the year, unless later months run colder than normal. Cost was $0.80 per 1000 lb of steam produced, and it was

FIG. 3—ANALYSIS CHART, set up on a monthly basis. "Cost per thousand" lines would normally be added for $0.60 per 1000 lb, $0.70 per 1000 lb, and so on. Similar charts could be drawn on a *yearly* basis, and used for a final summary at the end of each year



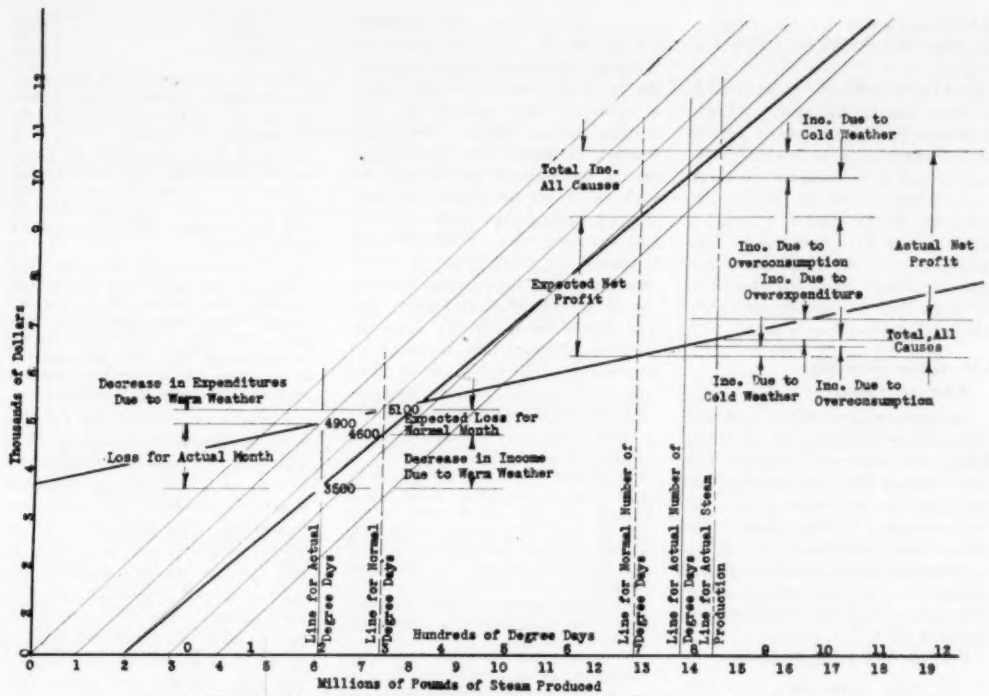


FIG. 4—USE OF MONTHLY analysis chart in accounting for all differences between actual and predicted costs is illustrated by two examples

sold for $0.58 per 1000 lb produced.

The first example illustrated the very simple case, for which all costs were the same as they were expected to be. This, of course, is not generally true. The next case will consider actual "accounting" for costs in such a case.

Assume:

Actual degree days	765
Normal degree days	700
Actual production	14.4 million lb
Actual income	$10,500
Actual expense	$7,000

The basic procedure follows the same order.

1) Erect the normal degree day line, and mark the income and expenditure indicated.

2) Draw a line for the actual degree days.

3) Note that production was higher than it should have been, as were expenditures and income. Another step must be added in the case where production is not given accurately by the actual number of degree days.

3a) Erect a line at the actual production figure.

4) Account for all differences in the location of points representing the same quantity. This is most easily done from the top down, keeping in mind that:

a) Steam *consumption* should depend only upon temperatures, and not upon production in any way.

b) Line losses should depend only upon production and not upon temperatures.

c) That if line losses are high, production *should* be high.

The "normal" income figure differs from the "actual" by the sum of two amounts. The first of these is the difference due to colder weather. The second is due to the fact that more steam was produced than should have been.

A little consideration here will show that this extra steam produced was required because the buildings used too much steam, for line losses are shown to be normal, while the consumption is too large for the number of degree days.

Comparing Estimate and Actual Figures

For the expense figures, a similar statement can be made. The difference between the estimate and the actual figure is accounted for in three pieces. The first is the difference brought about by colder than normal weather. The second is caused by high steam production, which was due to the higher building consumption. The third is unaccountable for on the basis of production, temperature, etc., and indicates an over-expenditure for labor or materials, or something.

This over-expenditure *must be* accounted for, and steps taken to see that it returns to *normal* the following month. This is done by quickly checking each of the individual expense items against the formula used to draw the total expense curve. It can be more easily done by adding curves to Fig. 3 for fuel vs. degree days, electricity vs. degree days, and so on.

The last month of operation at I. I. T. showed that this over-expenditure amounted to about $800. Checking against the chart showed that all expenses were close to normal with the exception of fuel. Fuel cost was about $800 too high. Further investigation uncovered the fact that the old units were used for three days because the load was too low to be carried by the new plant on pulverized coal. The cost of oil for the old plant was computed to be 2.92 × the cost of coal, per lb of steam produced, thus accounting for the $800 over-expenditure. It was found that it would be cheaper to waste whatever steam was necessary to bring the new plant within its operating range, rather than to use the old plant.

A report similar to the one in the first example can now be written, taking into account all of the factors which influenced the economics of the plant. Usually, this entire process can be completed in an hour at the most, including the time required to write a simple report, and orders to correct any losses resulting from poor operation. The effect of each month upon the year's operation can be found the first month of the year.

If the engineer would prefer to talk in terms of "per thousand" figures, these can be read from the chart as easily as can the total figures. With the exception of very unusual cases, the engineer need not leave his desk to spot steam leaks, over-consuming buildings, low efficiency — or what have you.

Further refinements of the system, additions to the charts, and extensions of the method can prove useful to the engineer, but space does not permit their discussion here.

It is interesting to consider that anything which can be done with graphs (such as used here) can be done without them. Tables could be compiled and used, or slide rule calculations would do the same job. For clarity, however, the authors feel that this graphical method is extremely good, and that it has advantages in total time required for analysis and ease of recording this analysis (by merely filing the chart).

It is felt that its use has resulted in dollar savings to Illinois Tech, and has made the job of "accounting" for steam costs a great deal easier.

Los Angeles Builds "World's Largest" Underground Garage

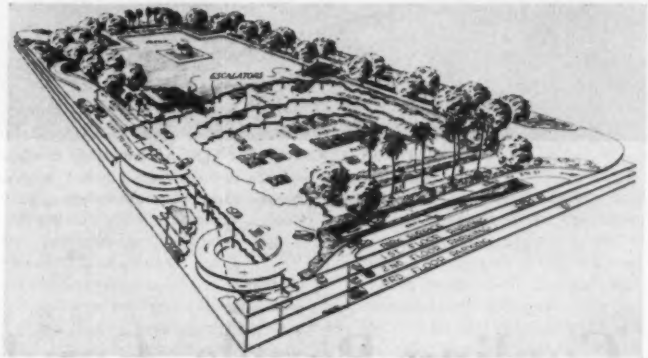
THE HEATING, VENTILATING and other mechanical installation work on the "world's largest underground garage," under construction in downtown Los Angeles and covering the 350 by 600 ft park bounded by Hill, Olive, 5th and 6th Sts., is being done by Lohman Bros. It involves some unusual engineering and installation problems and situations not ordinarily met.

Because this is a big building, all underground, the only heating will be by electric strip heaters in the garage offices. It is believed that the heat generated within the parking level areas by the 5000 cars to be parked daily and other heat sources, plus the mild climate and the fact that customers will arrive dressed to suit weather conditions, will provide sufficient comfort.

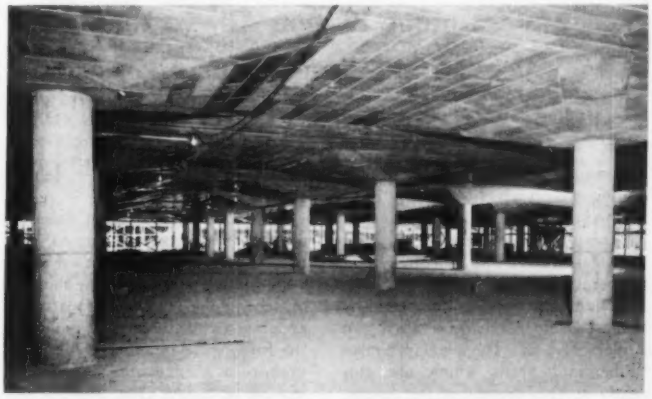
Morever, the concrete walls and floors should retain a certain amount of warmth.

There are eight inclined ramps from the park level to the first sub-floor below, and six huge helicoid ramps, each spanning 27 ft, extending from the first sub-floor down through the three floors. Adjacent to four of these ramps under the third sub-level will be installed the four 140,000 cfm ventilating blowers, each measuring 10 ft high by 9 ft wide and driven by a 60 hp motor. A complete change of air throughout the entire structure will occur every six minutes. Automatic fire dampers are provided in each duct riser at each floor level.

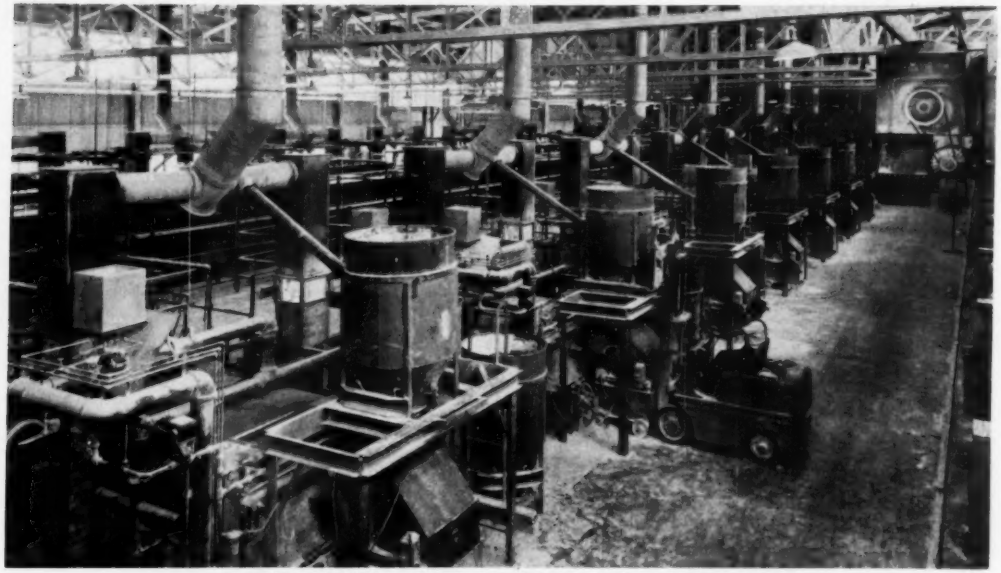
The project joint venture contractors are Ford J. Twaits Co., Morrison-Knudsen Co., Inc., and T-S Construction Engineers, Inc. The owner is the City Park Garage Inc., with Ford J. Twaits as president. Stiles Clements Associated Architects & Engineers are architects and engineers; Murray Erick is consultant. The project superintendent is Charles A. McMahon, and the project manager is R. H. Kirkman. —GIB CLARK.



SIX CIRCULAR RAMPS serve the parking levels



TYPICAL VIEW OF one of the parking levels in the new garage



RADIANT COOLING PANELS and completely conditioned air are combined to enable workmen to operate amid 2000 F temperatures at the new Owens-Corning Fiberglas Corp. plant at Anderson, S.C.

Cooling Panels, Conditioned Air Used at New Glass Yarn Plant

Unique System Allows Workmen To Operate Amid Temperatures Exceeding 2000 Deg

A UNIQUE COOLING AND air conditioning system which combines radiant panel cooling with distribution of completely conditioned air and allows workmen to operate amid temperatures exceeding 2000 F is used at a plant recently completed by Owens-Corning Fiberglas Corp. at Anderson, S.C. The plant produces "Fiberglas" yarns which are currently in high demand in the defense effort, and the air conditioning equipment was purchased under defense order ratings.

Thoroughly tested in an elaborate pilot plant operation, the new system holds temperatures to a maximum of 80 F and eliminates more than 90 percent of the heat radiations in the area surrounded on three sides by the furnace. A number of furnaces, grouped in a single area, combine the making of molten glass from the raw ingredients, and manufacture of the glass filaments, thus simplifying production of the yarns.

The filaments are drawn through tiny orifices in bushings which are maintained at a constant temperature above 2000 F. Temperatures of other surfaces surrounding the working aisles range from 350 to 650 F.

As designed for the Anderson plant, radiant cooling panels shield the working aisles from the melting tanks and the forehearths. These

panels cut off the heat radiations, and handle about 70 percent of the cooling. The panels are made of two thin sheets of steel welded together, with one of the sheets embossed to provide water circuits within the panel.

The additional air conditioning system necessary to establish the specified 80 F and 50 percent relative humidity supplies air through specially designed continuous slot, pan-type outlets. Air emerges from a slot in a duct running the length of the aisle, and is deflected into a diffuse stream.

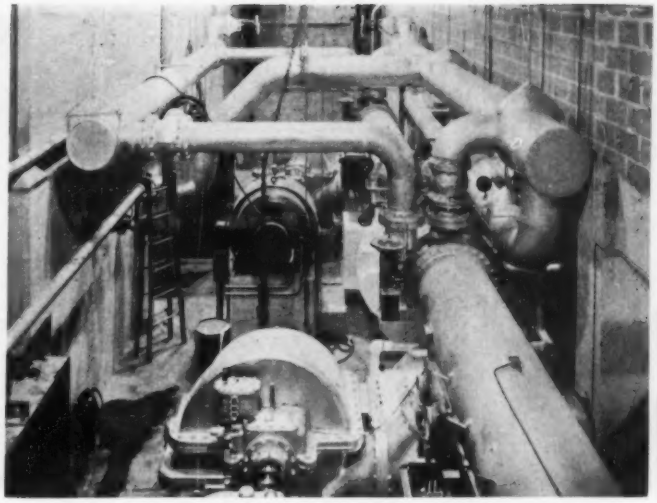
The filaments of glass drawn through the bushings are gathered into strands of yarn and passed through apertures in the floor to a winding area where they are wound on reels. The pulling action of the reels draws out the filaments until they are about 25/100,000 of an inch in diameter. Each strand of yarn contains over 200 filaments.

The fabricating area in the new plant, an extensive finishing room where the yarns are further processed — together with the plant offices, shops, cafeteria, and first aid rooms — are also completely air conditioned. A relative humidity of 60 percent is maintained in the finishing room.

Refrigeration for the air conditioning is provided by two 500 hp centrifugal refrigeration machines with a combined cooling capacity of 1000 tons. The radiant cooling panels enclosing the furnace walls and the refrigeration machine condensers are supplied with water recirculated through a spray pond adjacent to the plant. The water enters the cooling panels at a maximum of 85 F and leaves at 100 deg. Total cooling provided by both the panels and the air conditioning system is about 1350 tons.

Water for the air conditioning system and other plant requirements is piped through a 12 in. main from the city of Anderson, four miles away. The water used for cooling is recirculated through coils in the plant's air conditioning system, various units of the process equipment and the spray pond by 60 hp pumps, each having a capacity of 1500 gpm. There are four recirculating pumps and two additional ones as standbys. There is also a 1000 gpm fire pump.

Adjacent to the yarn plant are power and batch houses. Back farther



TWO 500 HP CENTRIFUGAL machines furnish refrigeration for air conditioning. The water for the panels enclosing the furnace walls is cooled by a spray pond

are the pump house and spray pond, and the equipment and storage tanks for propane gas, available as a standby for the natural gas fuel used.

In the power house are two 60 hp compressors for process air, three 350 hp boilers to supply steam for heating the plant during cold spells and for process work, and a 500 kva diesel-electric emergency power generator.

Maintenance shops, completely equipped with up-to-date tool and machine facilities, include pipe, sheet metal, carpentry, electrical and bushing fabricating shops.

Fibrous Glass Materials Extensively Used

Wherever they can make the Anderson plant's operation more efficient, increase employee working comfort or smarten appearance, fibrous glass materials have been used in construction.

Serving as a heat barrier and contributing to the plant's air conditioned comfort is fibrous glass roof insulation, covering the entire 265,400 sq ft of roof area of the main plant and boiler house.

Fibrous glass acoustical materials trap sound waves and contribute to a more quiet, restful, efficient work atmosphere in the plant finishing, cafeteria and office areas. In the finishing area, fibrous glass acoustical board forms a suspended ceiling over the noisiest section of this operation. In other sections, various types of fibrous glass acoustical tile are used ——with perforated, natural and membrane-faced surfaces.

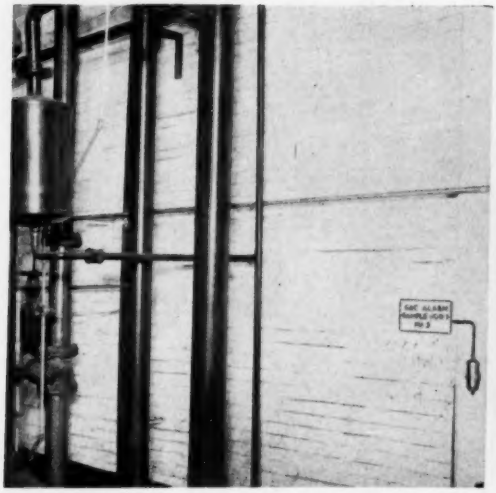
More than 500 fibrous glass air filters trap dust particles, soot and pollen. They are in banks, ranging from 8 ft wide by 5 ft high to 10 ft wide by 7 ft high.

The plant's air conditioning ducts are covered with fibrous glass insulation which serves a dual thermal and acoustical function.

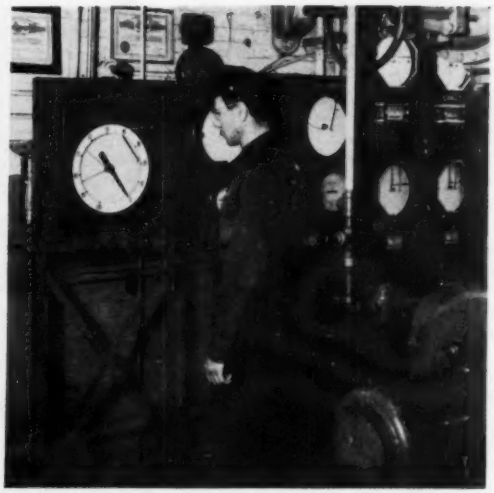
Fibrous glass pipe insulation is used on steam and chilled water lines and fibrous glass insulation is used on the steam boilers, as well as on the tanks and lines for application of sizing to the glass filaments in production.

Motors, generators, transformers and power lines have fibrous-glass-base electrical insulation. The underground gas distribution lines, connecting with the transcontinental main about 500 ft from the plant, are protected against corrosion by spiral wrappings of fibrous glass impregnated with a hot bituminous enamel.

Plans for the plant were prepared by Lockwood Greene Engineers, Inc. The general contractor was the Daniel Construction Co. [Photos courtesy Carrier Corp.]



ONE OF THE AIR SAMPLING intakes on the third floor of the still house. Opening is fitted with mechanical filter. At the left is one of the water seals between a still and the closed vapor venting system



RECORDING POTENTIOMETER keeps permanent hourly record of vapor concentrations in the still house as shown by the combustible gas alarm. Recorder is in boiler house adjoining still house

Automatic "Snoot" Sniffs Dangerous Alcohol Vapors

Central Detection Alarm System Guards Against Explosive Concentrations at a Large Distillery

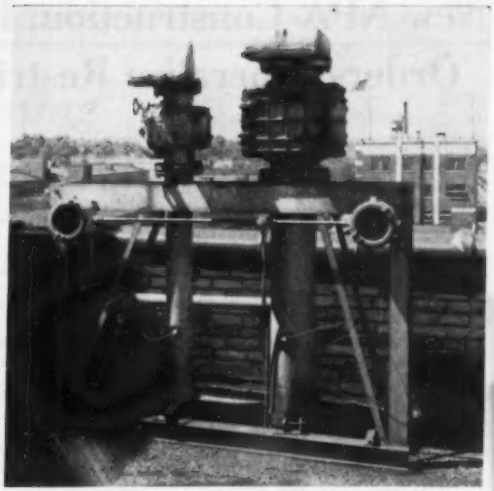
AN AUTOMATIC WATCHMAN with a super-sensitive "snoot" takes the guesswork out of protecting one of the country's largest liquor distilleries against explosive concentrations of alcohol vapors.

The vapor detection alarm in National Distillers Products Corp.'s four-story still house at Cincinnati works in conjunction with a closed venting system which has resulted in substantial savings by reducing the amount of alcohol vapor lost to the outside atmosphere. These two systems — plus vigilance of the company's safety department and still house employees — provide what is considered to be maximum protection for the hazardous operations in connection with distillation of alcohol. This is reflected in the plant's safety record, one of the best in the industry.

The closed venting system and the combustible gas detection and alarm were installed in the still house to provide a positive check on vapor conditions. All excess vapors are piped to the outside through two copper headers, one 6 in. and the other 10 in. Water seal tanks between stills and vent lines replace pressure relief valves which would discharge vapors within the building. Unless a leak occurs in piping, valves, pumps, flanges or pressure vessels, the vapors are discharged through outlets equipped with flame arresters at roof height. If a leak or some other condition does develop and vapors do accumulate in the still house, the gas analyzer will pick them up and immediately sound a warning. The detection and alarm system checks the vapor content of air samples from eight strategic locations in the still house.

The combustible gas alarm instru-

INSTRUMENT PANEL of the combustible gas alarm. At top of panel are eight indicator lights, one for each individual air sampling location



OUTLETS OF CLOSED VENTING system are equipped with flashback arresters. Warning is sounded if temperature of vapors vented exceeds 140 deg

ment panel is installed on the mezzanine floor where all the controls for the still house are located. The instrument itself is explosionproof.

If the concentration of ethyl alcohol vapor in an air sample reaches 40 percent of the lower explosive limit, an alarm circuit automatically is actuated to light a red light on the instrument panel and sound a loud horn. An indicator light on the panel shows from which of the eight sampling points the vapor-air mixture was taken.

In the instrument, air samples flow on a 30 sec cycle through a detector cell containing a heated platinum filament. This filament forms one leg of a balanced electrical circuit. A second filament is sealed in a compensator cell containing uncontaminated air. Any alcohol vapor present in an air sample passing through the detector cell is burned as it contacts the filament. This increases the filament's temperature and its electrical resistance, thereby unbalancing the circuit. The two filaments are calibrated so the degree to which the circuit is unbalanced is directly proportional to the percentage of combustible vapor present in the air sample.

The instrument is calibrated so contact is made through a relay in the contacting meter to actuate the alarm circuit when the vapor-air mixture reaches 40 percent of the lower explosive limit. The individual sample line indicator light remains on and the alarm circuit continues until the analyzer is reset by manual pushbutton. A pilot light on the instrument panel shows when it is in operation. Flow of air samples through the detector filament is measured continuously by a flow meter visible through the explosionproof glass face of the instrument.

Air samples are drawn to the instrument from the eight locations by a turbo-compressor integral with the equipment. At each sampling point, the intake line is equipped with a mechanical filter.

To provide a continuous and permanent record of vapor conditions in the still house, the analyzing instrument is equipped with a recording potentiometer which is located in the boiler house adjoining the still house.

Laboratory technicians test the gas analyzer periodically, by supplying one of the sampling lines with a known quantity of alcohol vapors. The instrument also is checked for air flow several times during a shift merely by looking at the flow meter.

An additional protective measure is a mercury switch arrangement for the two vent outlets on the roof of the still house. If the temperature of vapor being vented reaches 140 deg, an alarm is sounded.

Besides the actual mechanical importance of this alarm system in the still house, it also has a psychological value, according to G. U. Seilkop, safety director of the plant. Employees of the department have more confidence in the safety of the working environment when they know such an instrument is on the job, he said.

Other precautionary measures taken in the still house include use of explosionproof electrical fixtures and flashlights, strict rules against open flames and smoking, personal inspection by watchmen during nonworking hours, use of sparkproof tools for maintenance work, and spot atmospheric tests for combustible vapors before any welding or other "hot" work is undertaken. For the latter, portable battery-powered combustible gas indicators operating on essentially the same principle as the combustible gas alarm are employed.

HOW TO SIMPLIFY COOLING EQUIPMENT CHOICE

In looking through the March issue in which my article was concluded, I noted one error. Somewhere below the middle of the last column on page 97, where the conditions of the air entering and leaving the cooling coil are given, it is stated that the air "leaves at 60 F dry bulb". This should be 44.3 instead of 60.—Melvin A. Ramsey.

New NPA Construction, Housing Orders Liberalize Restrictions

THE NATIONAL Production Authority issued last month a new basic construction order, embracing provisions formerly included in three separate orders. The new order liberalizes some restrictions on the use of controlled materials—steel, copper and aluminum.

Last month's actions involved:

1. *Issuance of CMP Reg. 6 in revised form.* This order replaces the previous CMP Reg. 6, Order M-4A and Direction 1 to CMP Reg. 6. CMP Reg. 6 was the order which regulated construction under the Controlled Materials Plan.

2. *Revocation of Order M-4A.* This was the former basic construction order.

3. *Revocation of Direction 1 to CMP Reg. 6.* This was the order which described methods of obtaining critical materials for small construction projects by a self-authorization procedure under CMP.

4. *Amendment of Direction 4 to CMP Reg. 6.* This prescribes the procedure to be followed by water well drillers and prime contractors in applying for authorized construction schedules for water wells. It is amended to conform with the revised CMP Reg. 6.

5. *Issuance of Direction 5 to CMP Reg. 6.* This describes the procedure to be followed for use of defense order (DO) ratings for acquisition of metal working machines.

6. *Amendment of Delegation 14.* This delegates to other government agencies the authority to administer the construction regulations on categories of construction within their respective jurisdictions. It is amended to conform with the revised CMP Reg. 6.

7. *Issuance of Order M-100.* This is the new separate housing construction regulation.

The primary purposes of the new basic construction order, NPA said, are to liberalize certain restrictions on the use of critical materials, incorporate in one document all of the construction regulations previously contained in three separate orders and, as far as practicable, to simplify the language of the regulations.

Aside from numerous "housekeeping" changes in the regulations, major revisions include the following:

1. *An increase in the amount of steel that may be self-authorized for smaller commercial, school and other non-industrial construction.* The new order provides that 5 tons of carbon steel, including 2 tons of structural steel, but not any wide-flange beams, may be self-authorized per project per quarter for non-industrial, public and commercial construction other than housing and recreational construction and public roads. The previous order permitted only 2 tons of carbon steel, including structural steel.

2. *An increase in the amount of steel that may be self-authorized for road and highway building.* The new order provides that 25 tons of carbon steel, not to include more than 2 tons of structural shapes, may be self-authorized for each entire project (but not for each project per quarter). The previous order permitted only 2 tons of carbon steel, including structural steel.

3. *Permission to use foreign and used steel.* The new order permits the use of foreign and used steel in addition to a quantity of steel for which a builder has received an allotment with an authorized construction schedule, *provided* that he will not thereby require the use of greater amounts of copper or aluminum controlled materials than those for which he has received an allotment.

A builder without an authorized construction schedule may also use foreign and used steel *provided* that its use will not require more copper or aluminum controlled materials than the amounts for which he is permitted to self-authorize under provisions of the order pertaining to the particular category of construction involved.

The order specifically provides that the permitted use of foreign or used steel shall not be recognized as the basis for claiming a hardship in any application for adjustments or exception to provisions of CMP Reg. 6 as revised.

4. *Aluminum for electrical wiring.* The new order permits the self-authorization of aluminum for electrical wiring, but only if the builder reduces his copper requirements and uses the aluminum at the ratio of 1 lb of aluminum to 2 lb of copper.

5. *Dollar limitation on defense order (DO) ratings.* The new order places the following dollar limitations in the use of DO ratings on individual construction projects:

Construction category	Building equipment and materials (other than controlled materials)	Production equipment and production machinery
Industrial plant, factory or facility	$100,000	$200,000
All other "small construction projects"	15,000	5,000

6. *List of controlled materials.* The new order contains a complete list of controlled materials. Thus it will not be necessary to refer to other regulations.

The new order, which contains 34 sections in seven parts, has attached to it five tables: (1) Recreational, entertainment and amusement construction; (2) Quantities of controlled materials for which delivery orders may be self-authorized; (3) Controlled materials; (4) Jurisdiction of claimant agencies, and (5) Items of metal working machinery.

New Housing Construction Order

The new housing construction order, which is separate from NPA's overall construction regulations, relaxes certain restrictions on the use of steel but tightens restrictions on the use of copper.

Under NPA Delegation 14, Amended, the Housing and Home Finance Agency, as previously, is authorized to administer NPA construction regulations pertaining to all public and private housing not otherwise excepted.

The new Order M-100 contains substantially all of the provisions previously in NPA Order M-4A, CMP Reg. 6 and Direction 1 to Reg. 6. These orders now have been replaced by the new overall construction regulation, CMP Reg. 6, Revised.

The major changes in the new housing regulations involve the following provisions:

1. An increase of 500 lb of steel per housing unit in the amounts of that metal that may be self-authorized for from one to four family housing units, and a decrease of 25 lb of copper in housing units using copper water distribution systems.

2. Where local building codes require the use of types "B" or "K" copper tubing for underground water connections, an increase in the amount of copper is permitted.

3. Aluminum may be used in place of copper for electrical wiring on the basis of 1 lb of aluminum for 2 lb of copper.

4. For alteration, addition or extension of existing residential structures not more than 50 percent additional materials per new dwelling unit is permitted.

5. For alterations by initial installation of electrical wiring, or plumbing systems, additional amounts of steel or copper are permitted.

6. Self-authorization of materials is not permitted for the construction of temporary residential housing. Specific authorization is required for such construction.

7. Seasonal residential housing is not permitted unless an adjustment, or exception, to the regulations is obtained, if the use of more than specified amounts of materials is required.

8. Military and Wherry Act housing is exempt from the provisions of this order and is covered by Revised CMP Reg. 6.

9. Other special housing, such as farmstead, Atomic Energy and hospital educational housing come under the administration of the Department of Agriculture, the Atomic Energy Commission and the Federal Security Agency.

SAM LEWIS' PAGE

Prescription for Treating an Ailing Heating System

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems

I WAS CALLED IN on an ailing forced circulation hot water job and it may be worthwhile for the benefit of posterity to record some of the experience.

The building was thought to be too tall to be served by a single set of hot water mains, because the static water head might become too great for ordinary heat transmitters, fittings and valves. The designer therefore arranged overhead mains to supply downfeed risers for 12 stories. The circulating pumps merely overcame the frictional resistance, but with both flow and return mains in the attic, each pair of risers inherently was unbalanced — so that the warmest and major percentage of the water tended to short circuit through the nearest heat transmitters, and the heat transmitters most distant from the mains down the risers were "starved."

It was a big job to throttle permanently the rate of water flow to the heat transmitters nearest the overhead mains until uniform distribution all the way down each riser was achieved.

There were additional hot water flow and return mains near the basement ceiling, serving heat transmitters in the lower 12 stories. The designer, anticipating air vent trouble, connected the flow and adjacent return risers of the lower system together, above the top of the highest heat transmitter. And from this junction, he extended a vertical air relief pipe all the way to the attic.

How I Would Design the Piping

A peculiarity of this building is that the upper zone has an open expansion tank well above the flow and return mains, while the lower system has a closed expansion tank in the basement. The lower system is essentially self-balancing, since the longer circuit of water from the flow main up to the most distant heat transmitter and back to the return main is compensated for by the progressively increasing temperature drop.

Unfortunately, the risers in this building all are built-in and it is not practical to change them. Were I to design such a plant, however, all pumps and all flow and return mains would be in the basement. There would be two separate sets of mains, one for each zone, and the piping used in the mains and risers for the upper zone, even though in the basement, easily would endure the pressure of about 160 psi for that zone.

To drain the upper zone system I would design a valved riser from the bottoms of the flow and return verticals, superseding the unnecessary, originally-installed air vent riser for the upper stories.

No Shutoff Valves on Heat Transmitters

The heat transmitters as installed are without any manual shutoff valves. There is a damper in the front plate of each heat transmitter that is supposed to throttle the air flow over the heating surface and the resultant heat output.

There are many arguments in favor of omitting valves on convectors, with the claim that the damper alone will give successful temperature control. My experience, however, is that there should be a valve that can cut down the rate of water circulation also, since the heat stored in the convector, in its metal front and top, and in the adjacent wall tends to bring about a temperature over-run and to waste heat by causing opening of windows.

Noise a Problem To Correct

This building is very well built, of steel and concrete, so that noise transmission has proved a problem.

The pumps were supposed to "float" freely along with the concrete slabs to which they were bolted. Pipe connections to the pumps were to have flexible sections. Before we could correct the noise complaint, we were compelled to reduce materially the area of the isolation material under the pumps, so as to gain a weight on the floating pads of about 7 lb per sq in. rather than the original weight of 2 lb.

The alleged flexible pipe connections, as installed, were so thick and so rigid as to be even less flexible than plain pipes and were, without exception, placed in vertical pipes close to the pumps, in such manner that all chance of floating movement by the pumps was prevented. We were compelled to change these flexible connections.

We must also remember the possibility that a thin metal orifice placed in a union in the water supply to a heat transmitter in a mechanically circulating hot water system, may rattle or vibrate and may make the hearer think that Whistler's mother's son is around the premises.

I am favorably inclined toward the virtues of mechanically circulated hot water for heating buildings. These comments have been prepared to show the importance of correct design and installation details to assure complete satisfaction with the results.

Determining Ownership of Installed Mechanical Equipment

ARE COOLING AND refrigerating systems "trade fixtures" or part of the real estate? If sometimes one and sometimes the other — depending upon circumstances — how can the contractor so govern his actions as to run the least risk of losing his investment in a given project?

Light is shed on this and similar questions through a pertinent case, decided a few weeks ago by the supreme court of a western state. In our narrative summary, names of the parties are fictitious.

Back in 1926, George Nameless leased a sizable concrete building to his son Arthur, who thereafter equipped it as a packing plant and cold storage warehouse. From time to time Arthur augmented its cooling equipment by the addition of coils, piping, fittings, "brackets, fasteners, gages, thermostats", together with compressors and ice machines. Pipes and coils were fastened to walls and ceilings by means of brackets, bolts and screws. In some places the pipes penetrated the floors and concrete walls. The large compressor was bolted down through corner blocks and foundations; it was also connected to the refrigerating pipes or coils and with part of the refrigerating unit.

After the lease expired, Arthur Nameless continued to operate the meat packing plant on his father's premises. Depression years left their mark upon his business and in January 1939 Arthur was adjudged a bankrupt. A trustee nominally took charge but "exercised no dominion" over the plant (except as to a sale later discussed) nor did he continue the packing business. However, he permitted the cooling and refrigerating system to remain in the building "without severance".

On October 15, 1941, the trustee sold to A. Aye Corp., "all the personal property, goods and effects" of the bankrupt. A few days later, that corporation sold the cooling equipment to B. Bee Products Co., which in turn was a subsidiary of the C. See Packing Co. The last named concern leased the entire plant from the father, George Nameless — who still owned the real estate.

C. See Packing "took possession of the premises," including the cooling and refrigerating system. C. See's lease, dated in December 1941, was for one year. C. See continued to occupy as a month-to-month tenant after the lease expired until July 1947, when it vacated the premises and removed all the cooling equipment. Upon that act hangs our tale.

Bear in mind that (1) George Nameless continues throughout the case's history to be the owner of the real estate — the land and building; (2) B. Bee Products, which claimed ownership of the cooling equipment, is a subsidiary of C. See Packing, which leased the plant from George Nameless.

"Attached Accessories" Part of Real Estate?

In a suit brought against C. See Packing Co. by the elder Nameless, he claimed that the cooling and refrigerating equipment with "attached accessories" became *part of the real estate* when installed by his son Arthur, and that it never became an asset in Arthur's bankruptcy. Therefore, George Nameless maintained that the bill of sale covering such equipment passed no title.

The defendant packing company, on the other hand, contended that the cooling and refrigerating equipment with attached accessories were *trade fixtures*, owned by its subsidiary B. Bee Products. For this reason, the packing company claimed a "lawful right to remove the fixtures when it vacated the premises as tenant."

Said the state supreme court in its decision on appeal:

"That which is affixed to land is real property. A thing is deemed affixed to land when . . . permanently resting on it, as in the case of buildings, or *permanently attached to what is thus permanent*, as by means of cement, plaster, nails, bolts or screws." Whatever is affixed to real estate "without agreement permitting its removal belongs to the owner" of that real estate "unless he chooses to require its removal."

Arthur Nameless "affixed a cooling and refrigerating plant to the premises" of George Nameless "by means of cement, nails, bolts and screws without agreement permitting him to remove it." Therefore, the equipment appears to be "so affixed to the land as to belong to the owner of the land."

As to "trade fixtures", the rule applicable to ordinary fixtures does not apply in this case, the court held, citing the trade fixture statute: "Tenant may remove from the premises at any time during continuance of his term, anything affixed thereon *for purpose of trade, ornament or domestic use*, if removal can be effected without injury to premises — unless the thing has *become an integral part of the premises* by the manner in which it is affixed."

This view is in line with another case in the same state involving an electric lighting system. The lighting plant, "firmly attached to the floor of the basement . . . became

William Hurd Hillyer, author of this article, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

part of the real estate", ruled the court in that instance.

To return to our cooling plant story:

Judgment of the trial court awarding George Nameless, the building's owner, the sum of $4846 was affirmed by the higher tribunal.

(Incidentally, testimony in the Nameless case tends to exemplify the measure of increased value enjoyed by real estate through the installation of equipment such as this. Although replacement costs were $9700 in the evidence, a valuation loss of $14,800 was placed upon the building after the equipment's removal.)

Heating equipment, too, is part of realty, in the opinion of the supreme court of another state. The defendant tenants (a steel company) had installed heating units in a building which they occupied. After the building was sold to a certain investor, the steel people removed the equipment when they vacated. The investor, in a replevin action against the steel company, won both the case and the heating equipment.

Assure Protection Before Completion of Payment

These cases seem to establish, then, that heating, cooling and refrigerating equipment is often part of the real estate when installed. This fact semaphores the importance of a contractor making sure that his client is in such position that he is fully protected until he has completed payment. The entire ownership-tenancy set-up should be examined. If corporations with subsidaries figure in the deal, double care is indicated before the contract is drawn up.

Unforeseen bankruptcies and inter-company transfers may jeopardize collections, by replevin, lien or otherwise, unless all the parties at interest — whether tenant, property owner or presumable owner of equipment — have firmly committed themselves in writing at the outset, with pertinent assents and releases.

[Note: While this discussion applies to actual cases, it should be remembered that legal rules vary in different states.]

"QUOTE"

"Some of the people in our [atomic energy] program like to recall a story that was in circulation shortly after the first atomic bomb was exploded. I believe it was recorded first — at least in part — in the New York Times.

"The story has to do with a certain planet in the solar system of a distant star, where there flourished a civilization which for many thousands of years had based its economy on power produced from atomic energy.

"Great atomic power plants — complete with huge lead shields, chemical processing plants and radiation detection systems — dotted the planet's countryside, and produced the power to light its cities and turn the wheels of its industry.

"Every now and then one of these plants would explode and spread radioactive destruction over a large area, but this was deemed to be a rather small price to pay for the many advantages of nuclear energy — its compactness, its independence of oxygen, and its ability to regenerate its own fuel.

"Life on the planet under these conditions was not bad, although it did involve a number of imperfections. There were, for example, certain economic inequalities among various classes of people; there were differences in the political systems in various parts of the planet, and from time to time wars were fought, sometimes with the objective of gaining access to better sources of the raw material of atomic energy — uranium.

"It was under the pressure of one of these wars that a group of scientists and engineers set out to find a new source of energy independent of uranium.

"After a number of years of intensive effort, and the expenditure of many millions of the planet's equivalent of dollars, these scientists were elated to discover that it was possible to extract energy from certain black rocks that were in very plentiful supply.

"These black rocks they called 'coal.' All one had to do, they discovered, was to heat up this coal and it would burn brightly — thus releasing energy without heavy shielding, without deadly radiation, and without costly and complicated processing or the risk of explosion.

"This new and revolutionary discovery, which the people of the planet called 'chemical energy,' was hailed immediately as one of the most important events in the planet's history — second only to the original discovery of atomic energy. A new era was promised — an era of peace and plenty, when each man could have his own little coal fire, when coal would set the people of the planet free, and when real peace would flow from the plenty created by the release of chemical energy from coal.

"This fable manages to comment rather cynically and pessimistically on both the future of atomic energy and the nature of man.

"Personally, I am rather more optimistic about both, and I have repeated the story here, not so much to illustrate a point as to establish a setting in which we might discuss some of the goals toward which we are headed in the field of atomic energy."— GORDON DEAN, Chairman, United States Atomic Energy Commission, in remarks prepared for delivery before the Economic Club of Detroit last month.

CHOOSE SLOGAN FOR ENGINEERING CENTENNIAL

IN A MOVE TO awaken the public to the prominent part the engineering profession has played in bringing America to its present high economic and social levels, the Centennial of Engineering, to be celebrated in Chicago this year, will build its activities around the slogan, "Human Well-being Through Engineered Progress."

Adoption of this slogan to tell how engineering as a profession has set the pace for American progress since the first recognized civilian engineering society came into existence in the United States in 1852 was announced by the centennial's president, Lenox R. Lohr.

The slogan will keynote the new exhibit of world-famed engineering accomplishments to be staged at the Museum of Science and Industry in Chicago.

QUESTION OF THE MONTH

Using Air Curtains or Fans To Keep Flies Out

THE READER WHO asked about the problem of keeping flies out of kitchens, as outlined on page 102 of the February issue, probably has in mind industrial or commercial kitchens rather than those in the home. The fly is a persistent individual and the problem of keeping dairies, kitchens, bakeries and other areas free of flies is a substantial one.

Windows and other openings not subject to traffic can be protected by screening, electrified or plain. Doorways or delivery platforms involve heavy traffic and protective screen doors, when in the open position, provide the opportunity the fly is waiting for. The fly with his blunt body and high-speed wings packs a lot of horsepower per pound of weight and is quite capable of flying into a very strong breeze. By instinct or otherwise, however, the fly prefers calm air.

The majority of potential invading flies can be discouraged by a high velocity curtain, 3000 fpm or more, over the entire open area. Horizontal discharge across the doorway, emanating from a long narrow slot, will achieve this effect. Either the slot or the duct should be tapered and sized to assure even velocity within a reasonable range. Appearance and cost of duct work, horsepower involved, noise level and operating cost are all factors in the selection of this type of installation.

Another type of air screen involves relatively high velocity propeller fans mounted on the side or above the doorway. Properly screened to protect the blades from foreign objects, from one to three fans may be required — depending on the size of the doorway. The diverging blast from the propeller fans screens the doorway but does not produce as uniform a velocity screen as in the case of slotted duct work.

Initial cost, installation cost, horsepower and noise level are likely to be lower than with the duct work solution.

The most economical solution under most circumstances is probably the one employed throughout the southern states. Anyone traveling through the south in the summer is bound to notice the ceiling or paddle fan that is virtually standard equipment over the entrance doorway to every store or restaurant where food or drink is handled. These fans, usually 36 in. or 52 in. diameter, often consist of four wooden or metal blades, flat in profile and with about 30 deg downward pitch, spaced 90 deg apart on a central hub, operating at speeds from 225 to 450 rpm. They are very quiet in operation and develop an average velocity of only 500 fpm.

Even though the downward air pattern screens the entranceway very thoroughly, at no point is the velocity likely to exceed 700 fpm. It is apparent that in installations of this type, there must be some reason other than high velocity for discouraging flies. The theory advanced is that the four paddle, slow speed propeller casts shadows and that it is the "fly swatter" threat of the shadow that accounts for the success of this fan.

One hundred percent discouragement of invader flies is pretty hard to attain but you can approach it with centrifugal blowers, propeller fans or ceiling fans as outlined above.—M.L.A.

HOW CAN WE OPERATE WITHOUT SMOKING?

If you don't have the answer to one of your problems, chances are someone else does — or can be helpful on part of it. That's the purpose of this "idea exchange" in each issue, where questions on heating, piping and air conditioning are asked and answered.

You are invited to contribute a question for publication, or an answer to a published question. . . . . Please address your reply to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

Here are some questions on boiler and stoker operation, asked by a chief engineer. Can you help him out?

"We are operating three horizontal return tubular boilers, 150 hp, consisting of 70 4 in. tubes, 18 ft long. The operating pressure is 125 lb. The boiler furnace width is 6½ ft from floor to bottom of shell. The stoker is of the underfeed type, and the grate area is 33 sq ft. We are using washed coal of approximately 12,000 Btu. The distance from the shell to the top of the retort is 48 in.

"This boiler fires nicely and is fully automatic; however, when the load drops off and the stoker is idling, the boiler smokes.

"Our problem is to stop this smoking and still have full capacity of the boiler and also do this without any extra loss of steam or coal."

SHOULD WE BURN COAL OR OIL?

THE HEATING SYSTEMS in some of the buildings we manage are arranged for firing with either oil or coal, depending upon the current prices of these fuels, wrote J. W. in a question published in the January HPAC. We want to adopt some simple method of deciding from time to time which fuel we should use — where we have the choice — for the best heating economy, he said.

I suppose that perhaps charts are available giving the cost of generating steam with different fuels at various prices. I'd appreciate being referred to such charts, and would be interested in how other plant and building operators determine which of alternative fuels they burn when their plants are equipped to use more than one fuel, J. W. continued.

In answer to this question, another of HPAC's readers (H.L.M.) suggested that a certain chart giving the comparative values of fuels based on equivalent heat units be published. This chart appears in this month's issue as the Data Sheet. — THE EDITOR.

EXHAUSTING FROM DIESEL SHOPS

THE ADDITIONAL information on the question about exhausting from diesel locomotive shops, on page 104 of the February HPAC, defines the problems in more detail than was true in the original query. The unalterable facts as to location and type of outlet one could expect to be different for every piece of equipment. It was fortunate the field could be narrowed down to two pieces of equipment, assuming some means of local exhaust.

The problem in the Army shop, which I referred to in January, presented less difficulty with respect to caring for ducts and hoods since the unit would be stationary until it had been placed in working order once more. It was therefore recommended that the control units be located near columns or some out-of-the-way place to permit sufficient flexibility in repair operations. Roundhouses and engine sheds would probably require a different type of treatment in control. Present regulations require heating engines to certain minimum temperatures before they may be moved.

It would be expected that different makes of engines would operate at unlike outlet gas temperatures such as has been found to be the case with all types of internal combustion engines. The data presented in the table I reproduced in January hold only for the one engine listed.

Assumptions were made about the rest to indicate their order of magnitude. It would be expected that the idling temperature would be less than the full speed and would vary again under loading as well.

The Bureau of Mines articles on diesel exhaust gases indicate that there would be a hazard from SO_2 where the sulphur content of the fuel exceeded 0.4 percent. Joint Army, Navy and Air Force specifications permit something over 1.0 percent sulphur in their fuel. The production of carbon monoxide was 1/10th to 1/20th that of automobile engines. — C.F.B. (Engineer, Industrial Hygiene, Army Environmental Health Laboratory)

APPRECIATES DATA ON DIESEL SHOP EXHAUST

THE INFORMATION published recently in HPAC's Question of the Month department in answer to my question about exhaust ventilation and heating for diesel locomotive repair shops has been very helpful.

We have designed an exhaust and ventilation system for our shop, using unit heaters located below the working platforms to blow heat directly into the engine pits, and other unit heaters near outside building walls, with outside air connections, to heat intake air to replace contaminated air exhausted by roof ventilators.

We have also placed an order for nine power roof ventilators of 12,000 cfm capacity each for exhausting from this shop. — H.J.B.

ENJOYS SAM LEWIS' PAGE EACH MONTH

I WAS INTERESTED in the article by Robert M. Lantry, entitled *Solving Tricky Problem in Control of Air Supply Units*, published in the November 1951 HPAC.

Please tell Sam Lewis that I "worship at his shrine" regularly and enjoy his Page in HPAC each month. Ask him to write something soon (or, possibly, again) on the use of the face and bypass system of control as compared with nonfreeze coils and modulated steam pressure control, in very cold climates. — G. W. T. KEARSLEY, Oak Ridge, Tenn.

ANYTHING CAN HAPPEN . . . *(and sometimes does)*

• *We've all had trouble of some kind or another on a heating, piping or air conditioning job — trouble which never should have happened . . . . . but did! Here's a place for you to get the incident off your mind, and at the same time help others to avoid the same mistake. We'll keep your name out of it if you prefer. Address your contribution to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

PIPING EXPANSION — AND CONTRACTION

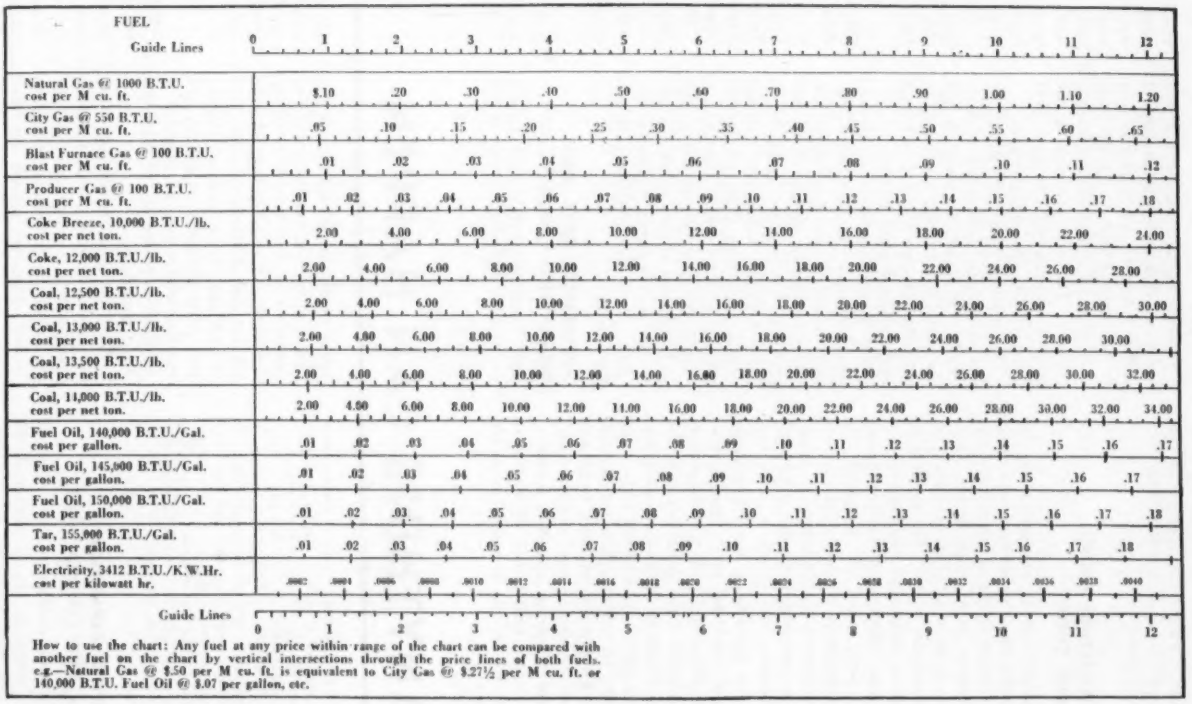
WE WOULD LIKE TO echo, with all the emphasis at our command, the moral drawn in the article *Don't Forget Contraction When Figuring Pipe Expansion* in the Anything Can Happen department of the March HPAC. The problem of either expansion or contraction during installation or test of a pipe line is one that is altogether too frequently forgotten or ignored by the installing contractor. We make every effort to prevent such difficulties by attaching to each one of our joints an instruction sheet carefully explaining the troubles which may be expected if adequate provision is not made for these conditions.

We had a case recently where all the expansion joints were carefully and properly installed and where all the anchors were apparently correctly and adequately placed, but when steam was put on the line the entire line began to move without regard to the laws of action and reaction. It developed that the anchors, while properly located, had never been actually bolted down, and as a consequence the line was free to move wherever it saw fit. Of course, errors can happen. This is merely an illustration of the importance of carefully checking a job before putting it into operation. — L.D.W.

"THREE QUALITIES OF JOINTS"

COMMENTING ON THE expansion joint experience reported on the Anything Can Happen page of the March HPAC, I'd like to say that notwithstanding the fact that expansion joints come in three qualities — good, bad and indifferent — failures charged to expansion joints are more often failures of the piping system due to improper guiding and anchoring.—S.Z.

Comparative Values of Fuels Based on Equivalent Heat Units



How to use the chart: Any fuel at any price within range of the chart can be compared with another fuel on the chart by vertical intersections through the price lines of both fuels. e.g.—Natural Gas @ $.50 per M cu. ft. is equivalent to City Gas @ $.27½ per M cu. ft. or 140,000 B.T.U. Fuel Oil @ $.07 per gallon, etc.

Reproduced by courtesy of the Ray Oil Burner Co.

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL *SECTION*

Moisture Migration in a Closed Guarded Hot Plate

By N. B. Hutcheon* and J. A. Paxton,** Saskatoon, Canada

SUMMARY—A study has been made of the migration of moisture in sawdust in a closed guarded hot plate. Evidence is provided in support of a method of predicting moisture distribution in hygroscopic materials at low moisture contents. Moisture distributions at high moisture contents are shown to be dependent on the movement of water as liquid from the cold plate toward the hot plate, in the direction of decreasing moisture content. Heat flow and moisture flow are shown to be inter-related, with a substantial proportion of the heat being transmitted as latent heat during the initial stages of moisture migration. The effect upon heat transmission of redistributed moisture contents, well below those producing saturation, is shown to be small.

PRESENT standards for the measurement of thermal conductivities of materials in guarded hot plates require that the test samples be thoroughly dried before testing. Since many building materials contain moisture in actual practice, it is important to know its effect on the transmission of heat through such materials. Many investigators have tested moist materials in guarded hot plates. The results have been expressed as coefficients of conductivity which have, in general, been found to increase linearly, or nearly so, with increasing moisture content. Several investigators have reported a migration of moisture toward the cold side during such tests.

The presence of moisture greatly complicates a hot plate test because the steady-state thermal conditions essential to the method are not achieved until the migration of moisture has also reached a steady-state. Similar difficulties may be encountered in testing hygroscopic materials which are initially dry; the samples under test may sorb moisture from the air surrounding the plate, resulting in a disturbed heat flow pattern as well as a definite moisture content at final equilibrium. Finally, there is the difficulty in interpreting the results obtained, and in relating them to the actual cases encountered in practice.

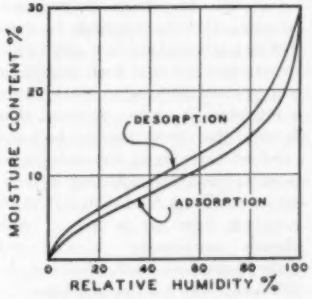


Fig. 1—Equilibrium moisture contents for spruce sawdust at 68 F

This paper presents the results of a series of tests carried out at the University of Saskatchewan on samples of spruce sawdust with various initial moisture contents, sealed into a 12-in., closed guarded hot plate. In these tests overall loss or gain of moisture was prevented and it was possible to study the migration of the moisture and its effect on the plate performance, as well as the final equilibrium conditions obtained. Certain limitations in the use of the hot plate were overcome in a special cell, 7 in. in size but of the same general construction, in which parallel series of tests were run.

Theoretical Considerations

Prior consideration of the action of moisture in testing wood fiber materials led to the conclusion that it might be possible to predict the final moisture distribution in a closed system from the known hygroscopic properties of wood. Curves for equilibrium moisture content for a sample of spruce sawdust at 68 F are shown in Fig. 1. The characteristic hysteresis effect as between adsorption and desorption may be noted. The Forest Products Laboratory

*Professor of Mechanical Engineering, University of Saskatchewan. Member of ASHVE.
**Graduate Student and Research Assistant, University of Saskatchewan.

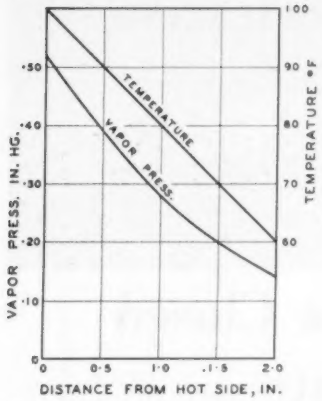


Fig. 2—Predicted vapor pressures in sawdust sample at start of test

data[1], which are widely known in connection with the processing and use of wood, give the average values for a wide range of temperatures. An increase of temperature lowers the equilibrium moisture content at a given relative humidity.

Consider a sample of sawdust having a moisture content of 5.4 percent by weight, dry basis, placed in a 2-in. space between hot and cold plates at 100 F and 60 F, respectively. Assume that the thermal conductivity is uniform throughout the sample and that a linear gradation of temperature therefore exists. It is possible to predict, from the Forest Products Laboratory data referred to, and ignoring hysteresis, the initial or potential vapor pressure gradation through the sample, before any migration has taken place, as shown in Fig. 2. The assumption is made that the vapor pressure gradation throughout the thickness of the sample may be represented by the vapor pressures of successive thin slices, each of which is considered to be at the original moisture content and at a uniform temperature corresponding to its position in the sample.

It is immediately apparent from consideration of Fig. 2 that there can exist a substantial driving force, a vapor pressure difference, to cause a vapor migration toward the cold side. As this migration proceeds, the vapor pressure will be reduced on the warm side, thereby reducing the relative humidity and thus disturbing the equilibrium condition between the moisture content of the material and the relative humidity of the void atmosphere. Evaporation of water from the sample may be expected. Also, by similar reasoning, it may be concluded that the vapor pressure and relative humidity at the cold side will tend to increase, and the material there will begin to sorb

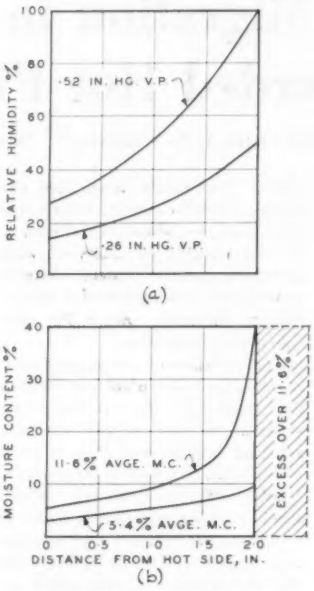


Fig. 3—Predicted final moisture distribution in sawdust sample

vapor, thus increasing its moisture content. If it be assumed, further, that migration takes place only in the vapor state and that such migration will proceed so long as there exists a difference in vapor pressure, that is, until the vapor pressure becomes constant throughout the sample, it is again possible, neglecting hysteresis, to predict a final distribution of moisture from the source of data already mentioned. A trial and error procedure must, however, be followed. Let it be assumed that the final uniform vapor pressure is 0.26 in. Hg. A curve of relative humidity throughout the sample may now be drawn as in Fig. 3 (a). From the assumed linear temperature gradation and the relative humidity, it is possible to predict the corresponding equilibrium moisture contents as in Fig. 3 (b), from the known data for wood. Integration of the area under the constructed moisture distribution curve indicates that the average moisture content is 5.4 percent. On the basis of the assumptions made, an initial, uniformly distributed, moisture content of 5.4 percent will be changed by migration under temperature gradient to a final moisture distribution varying from 3 percent at the hot side to nearly 10 percent at the cold side, with the final vapor pressure 0.26 in. Hg throughout. A similar procedure carried out for a vapor pressure of 0.52 in. Hg, as shown in Fig. 3, indicates that a moisture content of 11.6 percent will produce this final vapor pressure and that the final moisture distribution will vary from slightly over 5 percent at the warm side to about 40 percent at the cold side. It may be noted that the relative humidity at the cold side for this latter case is 100 percent.

It is interesting to consider, on the basis of the assumptions made, what might be expected if the initial moisture content were higher than 11.6 percent. The vapor pressure of 0.52 in. Hg, at the cold side, corresponding to saturation at 60 F, cannot be exceeded. Flow to the cold side ac-

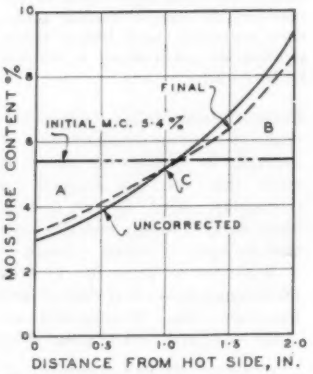


Fig. 4—Predicted shift in moisture including correction for hysteresis

[1]Exponent numerals refer to References.

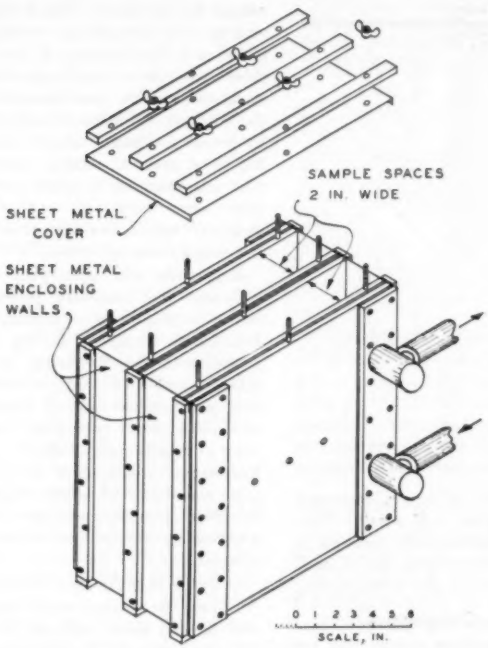


Fig. 5—Twelve-inch hot plate assembly

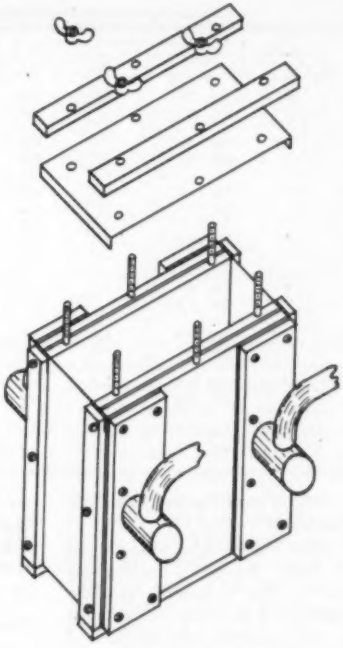


Fig. 6—Seven-inch test cell

companied by condensation on the cold plate may therefore be expected until the uniform vapor pressure of 0.52 in. Hg exists throughout, with 11.6 percent moisture distributed and held hygroscopically as before, and any balance collecting as liquid at the cold plate, as represented by the shaded area in Fig. 3. At this stage, the assumption that only vapor migration will take place is obviously no longer applicable since migration by gravity of the liquid condensed at the cold plate may be expected in a vertical plate, or movement of liquid to drier material toward the warm plate may occur. The results of investigations by others[2,3,4] indicate that a movement of liquid water in the direction of decreasing moisture content can take place, due presumably to capillary action. This has also been postulated by McDermott[5] and by Rowley[6].

No originality can be claimed for the basis of prediction used for moisture contents below those producing saturation at the cold plate, since this is implicit in the work reported in 1940 by Barre[7] in which he inferred vapor pressures from measured moisture contents and known hygroscopic properties of materials in test walls.

More recently, Munters[8], in a paper based substantially on the work of Johansson and others referred to in his paper, which was not seen until the tests reported here had been completed, appears to accept fully the method used. Further, he states that *capillary resoaking* will take place at moisture contents corresponding to high humidities, with liquid movement taking place in the direction of decreasing moisture content, regardless of the sign of vapor pressure gradient.

The influence of hysteresis, which has so far been disregarded, may now be introduced into the discussion. Fig. 4 shows the predicted distribution of moisture content from Fig. 3 for the 5.4 percent condition. The initial, uniformly distributed moisture content is also shown. It is apparent that an amount of moisture substantially as represented by the area A must be moved to make up the increase of moisture at the cold side as represented by area B. The material on the hot side of point C may be considered to have approached the final moisture condition from some higher moisture content and therefore desorption data should have been applied. Similarly, adsorption data may be assumed to apply to material on the cold side of point C. Seborg[9] has indicated an average ratio of adsorption to desorption equilibrium moisture contents of 0.86, so that a rough correction may be made by raising the curve of Fig. 4 by 7 percent of the values on the desorption side and lowering it by 7 percent on the adsorption side, and then completing the curve through the intermediate area for which the changes in moisture content during the approach to final equilibrium are in doubt. Similar corrected curves drawn for various other moisture contents are used in

Table 1—Moisture Conditions in Plate Tests

Test	Dry Density lb/cu ft	Final M. C. Percent of Dry	Moisture Distribution Percent of Dry Wt Hot	1	2	3	4	Cold
AP8.5	8.9	Top 7.8		5.4	6.8	8.3	10.9	
		Bot. 7.9		5.4	6.9	8.5	11.0	
AP7.8	8.7	Top 7.4		5.5	6.6	7.7	9.7	
		Bot. 7.5		5.4	6.0	7.9	10.3	
AP24	8.7	Top 24.0		9.9	12.4	17.3	56.3	
		Bot. 24.7		10.4	12.4	17.1	59.2	
AP30	8.7	Top 19.2		7.4	9.9	14.5	45.1	
		Bot. 45.5		15.1	23.2	46.5	98.5	
BP5	8.7	Top 4.7		3.5	4.1	4.9	6.4	
		Bot. 4.8		3.5	4.1	5.2	6.4	
BP10(a)	8.7	Top 9.9	4.6	6.2	8.0	10.0	15.4	22.8
		Bot. 10.2	5.0	7.7	8.8	9.6	14.8	24.8
BP10(b)	8.7	Top 10.0	4.7	6.4	7.8	10.1	15.7	24.0
		Bot. 9.6	4.9	6.4	7.8	9.5	14.5	24.0
BP15	8.7	Top 12.7	5.7	7.2	9.3	12.2	22.0	98.5
		Bot. 13.0	5.8	7.1	9.3	11.8	24.0	45.8

the study of experimental data later in the paper.

Further consideration of the initial and final moisture distributions shown in Fig. 4 suggests that the moisture at A must take on the latent heat of evaporation plus any heat of wetting before migrating as vapor to B, where the latent heat and heat of wetting are released as sensible heat in the sorption process. This immediately suggests the possibility that the overall transmission of heat will be increased by the presence of moisture. Such an increase is already well recognized but is usually considered to be due to increased conduction through the wetted fibers rather than to a parallel mechanism of heat transmission resulting from evaporation, vapor movement and condensation. The influence on heat transmission of this mechanism, if it exists, will be greatest at the start of a migration period when the vapor pressure differences and, therefore, the rate of migration, may be assumed to be greatest. A similar effect may be expected in the general case where moisture is continuously introduced at the hot side and lost at the cold side, with an intermediate change of state. Finally, if under condensing conditions at the cold plate there is migration of liquid toward the hot plate, thus supporting a steady return of moisture toward the cold plate as vapor, increased heat transmission will result. This will be in addition to the increase in heat flow resulting from the increase in conductivity of the wetted fibers.

Description of Apparatus and Procedure

The 12-in. hot plate, Fig. 5, had a 6-in. square test area, with a 3-in. wide guard ring. The hot plate assembly was made up of ¼-in. aluminum face plates with ⅛-in. gap between the test and guard areas. The heating coils which followed exactly the face plate areas were of nichrome ribbon wound on mica plate cores. The cold plates were also of ¼-in. aluminum plate, spaced by means of gaskets, with water circulation arranged in two passes. The hot plate and the two cold plates were maintained at a fixed spacing of 2 in. by sides and bottom of 28-gage tinned steel sheet which were fastened to the edges of the hot and cold plates by screws and metal strips. In use, the metal cover of similar construction was fastened in place and all edges were sealed with wax so that gain or loss of moisture from the test samples was prevented.

Experience with open plates had indicated that moisture migration into the open edges of initially dry hygroscopic samples during tests complicated the balancing of the plate, necessitated long periods of tests and, under varying humidity conditions, often prevented attainment of a satisfactory balance. It is interesting to note that the closed plate once balanced would remain so for days at a time without further adjustment, with either wet or dry samples.

It was evident, in view of the need for accurate temperature balance, that the hot plate could not be used for any accurate determinations of instantaneous rate of heat flow during any transient period short of the steady-state. It became necessary therefore to consider some other means of measuring the instantaneous heat flow during the migration period. Further, the hot plate was not a convenient apparatus for quickly establishing and maintaining the hot side temperature. For these reasons, it was found desirable to use a 7-in. test cell, Fig. 6, in

Table 2—Thermal Conditions in Plate Tests

Test	Dry Density lb/cu ft	Temperatures Through Sample —F Hot	1	2	3	4	5	Cold	k
AP8.5	8.9	101.4	94.1	87.0	80.1	73.2	66.6	59.7	0.42
AP7.8	8.7	100.6	93.2	87.0	81.0	73.8	66.9	59.0	0.42
AP7.4	8.6								0.43
AP3.3	8.6				AP7.4 dried in situ to 3.3%				0.43
AP12.1	8.2								0.44
AP3	8.2				AP12.1 dried in situ to 3.0%				0.42
AP24	8.7	97.9	89.6	83.2	76.4	69.9	64.2	59.7	0.50
AP30	8.7	101.0	92.8	86.3	79.3	72.3	65.6	59.5	0.49
AP0	8.7								0.42
BP5	8.7	100.2	91.9	86.1	80.5	74.1	67.9	59.7	0.44
BP10(a)	8.7	98.9	91.7	86.2	80.1	73.7	67.2	59.4	0.45
BP10(b)	8.7	99.0	—	85.2	79.2	72.8	66.1	59.5	0.46
BP15	8.7	98.6	91.8	85.9	79.5	72.4	65.8	59.5	0.47
BP0	8.7								0.44

which both hot and cold sides were maintained at the proper temperatures by water circulated from controlled-temperature reservoirs. A multiple-thermocouple heatmeter made by Gier and Dunkle was fastened to the face of the hot plate in contact with the sample, and was used for measurement of instantaneous heat flow rates.

Temperature gradations from hot to cold side through the samples were measured opposite the plate centers in both hot plate and cell apparatus by five thermocouples placed during filling and kept equally spaced by rubber bands in tension in a direction parallel to the plates. These couples were in addition to the thermocouples normally provided in the plate surfaces. Readings were taken at various times during migration and at the end of a test.

The moisture distributions in the sawdust test samples were determined by direct sampling, weighing in crucibles, drying for 24 hr at 212 F and re-weighing. In some tests, wood tabs were placed next to the hot and cold plates and their moisture contents determined. A specially made pair of tongs was used to extract a cylindrical core of material 1½-in. in diameter and 2 in. long from between the plates, for determination of moisture distribution. This core was then separated into four samples by inserting thin metal dividing plates into slots cut in the jaws of the tongs at ½-in. intervals. These samples were then weighed, dried and re-weighed and the results taken to represent the average moisture contents at the sampling locations for each ½-in. thickness of material from the hot to the cold side. All moisture determinations were expressed on a percent by weight, dry basis.

Table 4—Final Thermal Conditions in Cell Tests

Test	Dry Density lb/cu ft	Temperatures Through Sample —F							k
		Hot	1	2	3	4	5	Cold	
AC7.8	9.5	100.5	93.5	86.9	80.5	74.2	67.5	60.0	0.49
AC10.5	8.5	102.0	93.3	86.6	80.7	73.6	67.5	59.7	0.45
AC12.9	8.3	101.5						59.8	0.42
AC22.5	8.2	101.5	92.5	85.4	79.1	71.7	65.3	60.3	0.49
AC30	8.7	101.4	91.9	83.9	77.4	69.8	64.1	59.7	0.56
BC0	8.7	100.6	92.7	86.2	79.8	73.0	67.1	59.8	0.46
BC6	8.7	101.7	93.9	87.3	80.6	73.7	67.6	59.7	0.46
BC11	8.7	101.4	93.6	—	80.3	73.9	67.4	59.7	0.51
BC14	8.7	101.3	93.3	87.5	80.7	74.3	67.4	59.7	0.47
BC21H	8.7	101.8	93.4	87.3	80.7	74.6	67.6	59.8	0.50
BC30H	8.7	101.0	92.5	85.0	79.0	72.0	66.0	60.0	0.52

Tests Made

Spruce sawdust was chosen as the test material because it produced a light, porous fill, representative of insulating materials generally, which could be readily divided and sampled, and then remade after sampling. A hygroscopic material was indicated, and equilibrium moisture data were available for wood.

Two series of tests, designated Series A and Series B, were run in both the 12-in. hot plate and the 7-in. cell. The sawdust in Series A tests was conditioned to various moisture contents up to 20 percent by exposure to a controlled atmosphere. For higher moisture contents, additional water was added. The material used in this series was re-used in tests at successively higher moisture contents but was never completely dried until the completion of the wet tests. The sawdust in Series B was obtained from the same source, but was conditioned by drying at 165 F after each test and then the required amount of water was added for the next test at a higher moisture content. All material was stored in a sealed container for about 24 hr, and was mixed by rotating the container for at least 3 hr, prior to use. The required weight of conditioned sawdust to produce the desired dry density in the test apparatus was determined, and the correct amount of material was filled into the sample spaces by quarters, with compaction after each quarter filling. Dry densities varied from 8.2 to 9.7 lb per cu ft, but were held constant as far as possible at 8.7 lb per cu ft in the majority of tests. This latter density was fairly definitely established by the minimum density for no settlement in the dry state and by the limiting compression which could be applied in packing the expanded, wet material at the highest moisture content, for the same dry density in both cases.

All tests were started from uniform conditions at room temperature and run to steady-state conditions at 100 F on the hot side and 60 F on the cold side. All samples were 2 in. thick. Hot plate tests were allowed to run to steady-state, when temperatures and heating current were read, and samples were taken for moisture distribution. In the case of the cell tests, measurements of plate tempera-

Table 3—Final Moisture Conditions in Cell Tests

Test	Dry Density lb/cu ft	Final M.C. Percent of Dry	Moisture Distribution Percent of Dry Wt					
			Hot	1	2	3	4	Cold
AC7.8	9.5	7.7		5.7	6.9	7.8	10.5	
AC10.5	8.5	10.2	5.7	6.6	8.3	10.3	15.7	26.7
AC12.9	8.3	11.5	6.1	7.0	9.0	11.4	17.7	30.0
AC22.5	8.2	21.7		8.2	11.3	21.0	46.2	
AC30	8.7	27.7	7.4	9.9	13.0	19.1	69.0	69.1
BC0	8.7	0						
BC6	8.7	5.4	4.2	4.2	5.0	5.7	6.9	8.7
BC11	8.7	9.8	5.5	6.5	8.4	10.3	14.2	19.3
BC14	8.7	12.6		7.5	10.2	13.0	19.8	
BC21H	8.7	11.5		7.0	8.8	11.8	18.8	
BC30H	8.7	17.4	5.5	7.5	9.9	14.4	37.6	155.0
AC20H	8.7	16.5	6.3	7.6	10.2	14.3	34.0	67.5
BC20H	8.7	13.3	6.1	7.3	9.4	12.4	24.0	108.5

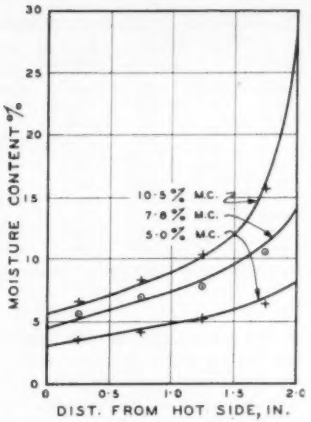


Fig. 7—Comparison of predicted and measured moisture distributions for samples below 11.6 percent moisture content

ture, temperature gradation, and heat flow were usually commenced 15 min after establishing the test temperatures, and continued at increasing intervals until steady-state conditions were achieved. Samples for moisture distribution were then taken.

Results and Discussion

The results obtained from Series A and Series B tests in the hot plate are presented in Tables 1 and 2. The results obtained at final steady-state conditions in the test cell are presented in Tables 3 and 4.

The designation for each test indicates the material used, the apparatus, and the conditioned moisture content. For example, in Table 1, BP10 (*a*) indicates a test made with Series B material in the hot plate. The initial moisture content was 10 percent. This test and the one following, which were both run at 10 percent, are designated by the letters (*a*) and (*b*). Referring further to the results of this same test, it will be noted that the average of the moisture contents for each ½-in. thickness at the end of the test was 9.9 percent for samples taken at the top and 10.2 percent for samples taken near the bottom of the plate. All tests, with the exception of those in Table 3, for which the designations are followed by the letter H, were run with the plate, or cell, vertical, so that the influence of gravity was normal to the direction of heat and moisture migration.

The columns under *Moisture Distribution* in Tables 1 and 3 give the moisture contents at the hot side and at the cold side as determined by the wood tabs inserted at these locations. The results in the intermediate columns headed 1 to 4 are for the ½-in. thick samples taken in order from the hot to cold side. Similarly, in Tables 2 and 4, the data in the Hot and Cold columns are hot and cold plate temperatures respectively and in columns 1 to 5 are the temperatures at each sixth point as read by the five intermediate thermocouples inserted in the samples.

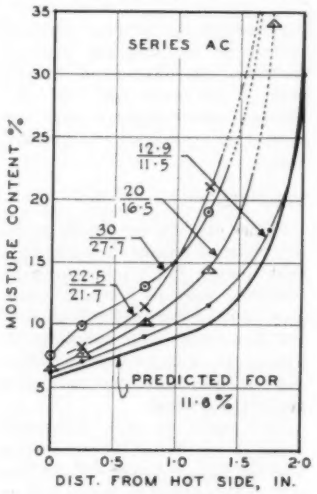


Fig. 8—Final moisture distributions in Series A tests over 11.6 percent

There are shown plotted in Fig. 7 the results of the final moisture samplings compared to the predicted distributions, for tests BP 5, AC 7.8 and AC 10.5. It should be noted that the value plotted at the mid-point of each ½-in. thickness represents the average moisture content over the ½-in. sample, for direct comparison with the corresponding predicted value at that point as shown by the curve. It does not represent necessarily the true moisture content at the mid-point. The agreement shown must be considered as very good in view of the difficulties in sampling, the difficulty of predicting from existing data the equilibrium moisture contents for humidities near 100 percent, and the fact that the hygroscopic data used were not specifically determined for the material in question. The measured values for the other four tests run at moisture contents below 11.6 percent show, when plotted, correspondingly good agreement with the predicted values. Discrepancies are less than 10 percent of the values in most cases.

Final moisture distributions for tests at average moisture contents over 11.6 percent are shown in Figs. 8 and 9. Again, it may be noted that the test curves are drawn to identify the points and do not represent true moisture distributions. The results for test AP 24 are shown separately in Fig. 13 (a). The amounts of moisture held in the material are greater than those predicted, assuming condensation at the cold plate with no return of moisture toward the hot side. The Series A tests show definitely higher moisture contents throughout the samples than do the Series B tests. The values used to designate the test curves in Figs. 8 and 9 give the initial or conditioned moisture content as the numerator and the final moisture held in the material as determined by test, as the

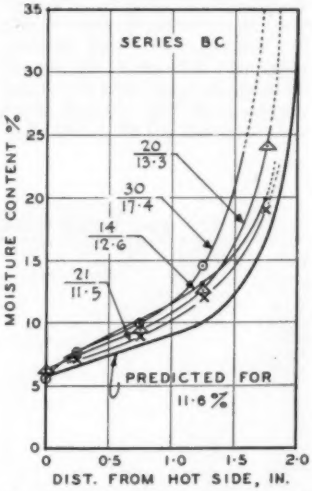


Fig. 9—Final moisture distributions in Series B tests over 11.6 percent

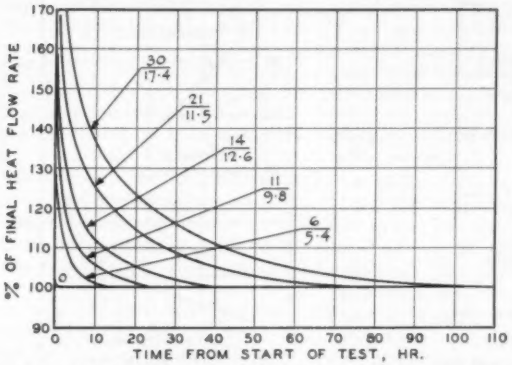


Fig. 10—Variation in heat flow during migration in Series BC tests for various moisture contents

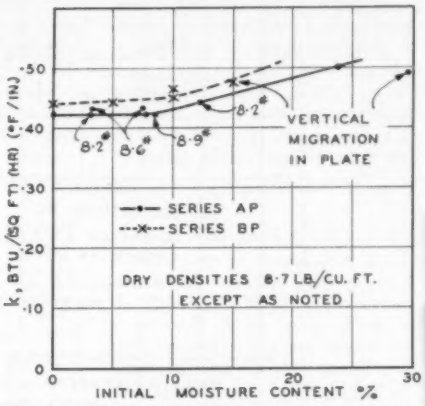


Fig. 11—Conductivity *vs.* initial moisture content by the hot plate

denominator. Any discrepancy between these figures, apart from sampling error, can be attributed to water remaining at the cold plate and not caught in the sampling, or by water present in different amounts throughout the sample at points other than those at which samples were taken.

The results of Series A tests in Table 1, for which sampling was carried out at both top and bottom of the vertical sample, show very little migration by gravity until the average moisture content exceeded 24 percent. Series B tests show little variation from top to bottom up to 15 percent moisture content. No test results for higher moisture contents in Series B material in the hot plate were included because of the excessive vertical migration which occurred. Similar results may be noted for the tests in the 7-in. cell shown in Table 3. A moisture content of 27.7 percent was accounted for in test AC 30 by sampling carried out at mid height, while in tests BC 21 and BC 30, which were run with the cell horizontal, only 11.5 percent and 17.4 percent moisture, respectively, were accounted for in the final sampling. Tests with Series B material in the cell at moisture contents over 14 percent were run with two cells, in duplicate, with the cells in a horizontal position. No marked variations in final moisture distribution were found as between the cold side up and cold side down positions. Reversing the positions of the cells, after steady-state conditions had been established in one position, had no noticeable effect on the heat flow as measured by the heatmeter, or on the temperature gradation through the samples.

The results indicate the possibility of a definite difference in the liquid-water transfer properties (which will be designated as *wicking)* of the materials in the two series. A simple *wicking* test made by filling material into a 1-in. diameter glass tube, 12-in. long, and immersing the lower end to a depth of 1 in. in water, showed no capillary rise of any consequence in the case of either Series A or Series B material after completion of the test work. However, a freshly sawed sample of material which had not previously been subjected to drying or to conditioning showed a capillary rise of about 8 in. with moisture contents of 531, 227, and 169 percent at ¾, 3-¾, and 7-¾-in. heights respectively, above the water surface. In spite of the negative result shown by this test in differentiating between Series A and Series B materials in their final conditions, the marked change in *wicking* action, shown to have been brought about in both cases by the aging or handling and other treatment during the regular test program, supports the possibility that differences may have existed at various times throughout the program, as reflected in the differences in the moisture distributions of Figs. 8 and 9.

The variations in heat flow during moisture migration as measured by the heatmeter, for Series B tests in the cell are shown in Fig. 10. It may be noted that the time to reach steady-state heat flow, which was less than two hours for dry material, was increased to about 24 hr when 11 percent moisture was present, and to 110 hr for 30 percent moisture content. The rate of heat flow was greatest at the start of a test, presumably when the rate of migration of vapor was greatest. Series AC tests showed almost identical results up to 15 percent moisture content, but required about 10 percent longer to achieve final equilibrium at 21 and 30 percent moisture content. The additional heat flowing during the migration period as estimated from the data of Fig. 10 can be shown to be roughly equivalent to the latent heat required to evaporate the net amount of moisture moved.

The coefficients of conductivity as determined from hot plate tests are shown plotted against the initial moisture contents in Fig. 11. Tests AP 3.3 and AP 3.0 were, as noted in Table 2, run on the same samples as tests AP 7.4 and AP 12.1 respectively, which were dried to a lower

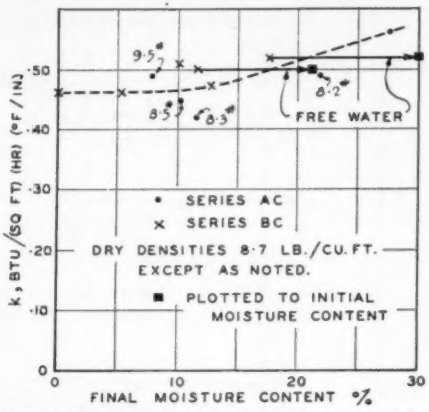


Fig. 12—Conductivity *vs.* sampled moisture content by heatmeter in 7-in. cell

Table 5—Analysis of Heat Flow in Test AP 24

Dist. from Hot Side, In.	Δt F Deg	H, Dry Btu/(sq ft) (hr)	9.8 — H Btu/(sq ft) (hr)	Apparent Conductivity k
0 — ½	11.3	9.5	0.3	0.43
½ — 1	10.5	8.8	1.0	0.47
1 — 1½	9.9	8.3	1.5	0.50
1½ — 2	7.8	6.6	3.2	0.63

H = heat transfer through dry fibers, Btu per (sq ft) (hr).
9.8 = total heat transfer through sample, Btu per (sq ft) (hr).

moisture content in situ, by opening the plate and exposing the material to dry air without otherwise disturbing the samples. The corresponding conductivity data for the cell tests are shown in Fig. 12. The coefficients of conductivity are calculated here on the basis of the heatmeter calibration as provided by the manufacturer. The points are seen to be scattered, particularly in the region of 10 percent moisture content, but are not inconsistent with a curve of the same form as those drawn for the hot plate results. The dry densities for the Series A tests were not all controlled to the value of 8.7 lb per cu ft used in Series B tests, so that some difficulty is introduced in interpreting the results. Another complication arises in the case of test AP 30, Fig. 11, where a marked vertical migration occurred, and in the case of Series B tests, Fig. 12, at the higher moisture contents, where the final moisture determinations failed to account for the initial water content.

The data of Fig. 11 indicate a difference of about 5 percent in conductivity as between Series A and Series B material, and in both cases the coefficient of conductivity is shown to be substantially constant up to a moisture content of 7.5 percent, after which it increases. Babbitt[10] has suggested that capillary filling begins at relative humidities above 75 percent. It is interesting to note that for the temperature conditions maintained in these tests, 75 percent RH at the cold plate is produced by an average moisture content of about 8 percent. These results suggest that the presence of moisture in the material has little effect on the overall heat transmission until the moisture content reaches the point where capillary filling may be expected. Examination of the final temperature gradations as given in Tables 2 and 4 indicates a departure from linearity only at initial moisture contents of 20 percent or higher.

There seems little doubt that the moisture movement during test was accomplished mainly by evaporation, vapor migration and condensation. At moisture contents over the minimum for saturation at the cold plate, it may be assumed that there was a movement of liquid from the cold plate back toward the hot plate. This would explain the high moisture contents of Figs. 8 and 9 which are in excess of the values predicted on the basis of a constant vapor pressure through the sample. These higher moisture contents, conversely, indicate vapor pressures throughout the sample higher than those existing at the cold plate. The measured moisture contents for test AP 24 shown in Fig. 13 (a), together with the appropriate temperatures, have been used in conjunction with the hygroscopic data to predict the vapor pressure gradation which must have existed throughout the sample. The actual vapor pressures so found and as shown in Fig. 13 (b) are seen to decrease toward the cold side. It

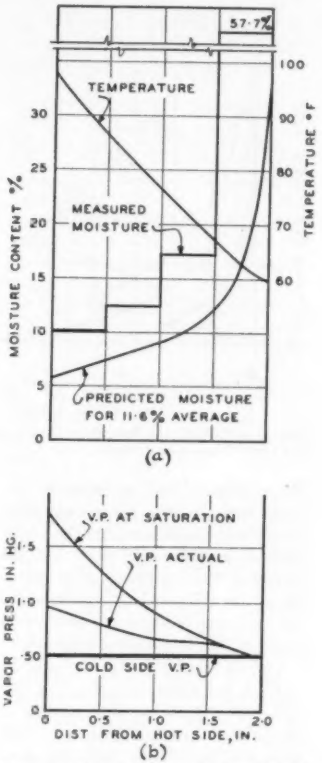


Fig. 13—Final conditions for Test AP 24

seems most likely therefore that at final steady-state conditions, a dynamic condition existed, with movement of liquid from the cold plate toward the hot plate, supporting a steady flow of vapor in the opposite direction. This liquid movement is the *capillary re-soaking* referred to by Munters, and the *transorption* of Joy, Queer and Schreiner[11]. It is almost certainly the result of capillary action, for conditions close to saturation at the cold plate. At conditions below saturation, with capillaries only partially filled, it may be that some movement of bound water can occur by spreading of sorbed layers of water molecules[12] or by a combination of spreading and capillary movement. If so, this might account for a substantial portion of the increased transmission of heat shown in Fig. 11, beginning at a moisture content of 7.5 percent, corresponding roughly to 75 percent saturation at the cold plate. Such a movement, below saturation, is not reflected, however, in the moisture distributions shown in Figs. 8 and 9, or by any marked deviations from linearity in the measured temperature gradations.

It has been contended that it is impossible to have capillary movement in the direction of increasing vapor pressure, since the vapor pressure over liquid surfaces in capillaries must decrease in the direction of lower moisture contents. This argument, however, is based on the assumption of isothermal conditions. Reference to theory will indicate that the effect of the curvature of the liquid surface in a capillary is to lower the vapor pressure below that corresponding to saturation conditions over a flat water surface at the same temperature. The curve of saturated vapor pressure corresponding to the temperature gradation of Fig. 13 (a) is shown in Fig. 13 (b). It will be seen that the difference between the saturation vapor pressure and the actual vapor pressure increases toward the hot plate; a capillary movement toward the hot plate is not therefore incompatible with a vapor movement in the opposite direction, at least so far as vapor pressures are concerned.

Direct measurement of the vapor pressures at the hot and cold sides would establish more definitely the migration mechanisms involved. Attempts to do this, using humidity-sensitive elements in small connecting cells, have so far been unsuccessful. Such measurements are, however, extremely difficult to make with sufficient accuracy.

A further analysis of the results of test AP 24 is shown in Table 5. Overall heat flow was 9.8 Btu per (sq ft) (hr) at 39 deg temperature difference. The coefficient of conductivity k for dry material was found to be 0.42. The temperature difference across each ½-in. thickness from the hot side to the cold side as found by direct measurement is listed in the first column. Assuming that the conductivity for the wood fibers is the same as that measured for a dry sample, the heat transmitted through the fibers in each ½-in. segment can then be found. The difference between this value and the overall transmission of 9.8 Btu represents the increased heat flow resulting from other mechanisms due to the presence of moisture. This is shown to increase as the cold side of the sample is approached. The apparent coefficients of conductivity for each segment are also shown.

The practice of expressing heat flow through moist materials of the type studied, in terms of an apparent coefficient of conductivity related only to moisture content, must seriously be questioned. Values of k for moist materials will be generally useful only if it can be shown that transmission of heat resulting from the presence of moisture is largely dependent on concentration and on temperature gradient, and is substantially independent of concentration gradient. Reconsideration of the effect shown by the data of Fig. 10 indicates that this is unlikely to be the case, and that it may be necessary to consider the flow of moisture, interrelated with the heat flow, for each individual case.

A number of tests have been reported in which testing was carried out as quickly as possible in order to minimize the redistribution of moisture. Reference again to Fig. 10 indicates that while this practice minimizes the redistribution occurring before the end of the test it may also provide a value of heat flow rate which is greatly increased as a result of the higher rate of moisture flow occurring at this stage of the migration.

Conclusions

Tests were carried out on one material only — spruce sawdust. It is generally accepted, however, that the hygroscopic properties, and other properties, relating to the effects of moisture, which are not specifically determined by the physical form of the material, are similar for all cellulosic materials. In view of this, it seems reasonable to apply certain of the results found for sawdust to natural-fiber products generally. In particular, there seems to be no reason to doubt the applicability to all hygroscopic materials of the method of predicting equilibrium distributions in hot plate testing at moisture contents below those producing saturation. The increased heat flow resulting from the flow of moisture may also be expected in all vapor-permeable materials. The effects of moisture on heat transmission may however be expected to vary widely for different materials, depending upon their *wicking* action and their permeabilities to vapor and to liquid, as well as on the moisture-content gradient.

While directed specifically toward a study of moisture from the point of view of hot plate testing, this investigation has provided evidence of certain phases of the action of moisture under temperature gradient.

Conclusions which may be applied to the testing of moist hygroscopic materials in a hot plate are as follows:

1. Redistribution of moisture in a hygroscopic test sample commences as soon as a temperature difference is established across the sample.

2. Steady-state, heat flow conditions cannot exist in the sample until the migration of moisture has also reached a steady state, since the heat and moisture flows are inter-related.

3. The time required for redistribution of moisture in a sample increases with increasing sample moisture content.

4. The heat flow through the sample during the period of moisture migration is higher than that at final steady-state conditions; apparent conductivities measured while moisture is migrating will therefore be higher than those measured at steady-state conditions, by an amount dependent on the rate of moisture movement.

5. Moisture distribution at steady-state conditions in a hot plate test may be predicted on the basis of constant vapor pressure and known hygroscopic properties of the material, for moisture contents below those producing saturation at the cold plate.

6. Prediction of moisture distributions where saturation conditions exist is difficult and depends upon the *wicking* action, which may vary widely. Excess moisture from the saturation zone may migrate by gravity, or it may be fully retained by the material and moved toward the hot side. In this latter case, a dynamic equilibrium between vapor flow toward the cold plate and liquid flow toward the warm side may exist and the conduction of heat thereby increased.

The following conclusions may be drawn with specific reference to the material tested:

7. Conductivity is only very slightly affected by moisture contents below those which produce saturation.

8. The *wicking* action and therefore the tendency to transfer liquid in a test can be changed markedly by the processing of the material.

Further conclusions as follows would appear to be justified:

9. Measurements in the guarded hot plate should normally be made on material initially dry and maintained so throughout the test.

10. Failure to dry the material under test thoroughly or to maintain a dry atmosphere around the usual open plate will probably not change the results materially from those obtained under dry conditions provided that the moisture contents which result are substantially below those producing saturation at any point, and provided that the test is run until steady-state moisture conditions are achieved.

11. Values of conductivity obtained by testing moist materials in a hot plate may be of limited value when used in the usual heat flow equations for prediction of heat transmission.

Acknowledgments

This investigation was carried out as a research project within the Department of Mechanical Engineering, University of Saskatchewan. It represents a contribution to a program of cold-weather wall research being carried out cooperatively by the University of Saskatchewan and the Division of Building Research, *National Research Council*, Canada.

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DR. KEHOE — THE ENGINEER FOR '52

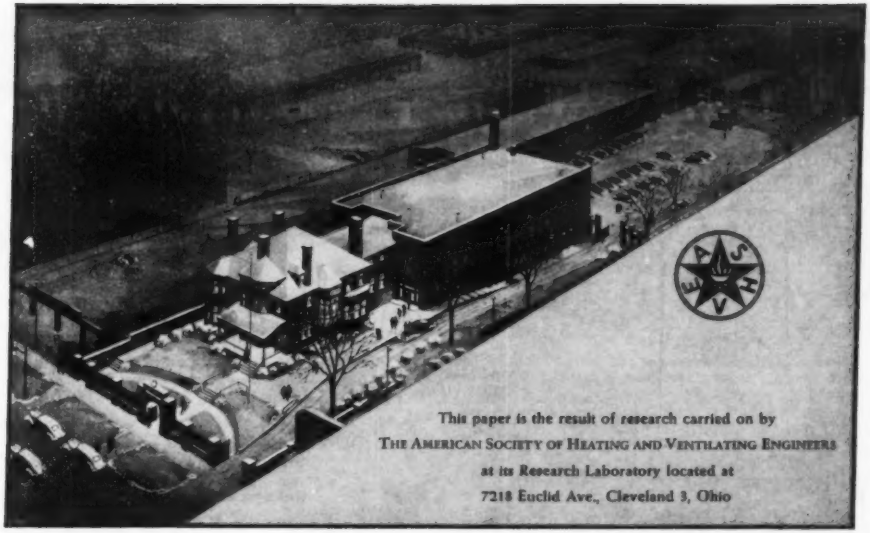
Dr. Robert A. Kehoe, M.D., director of the Kettering Laboratory, University of Cincinnati College of Medicine, Cincinnati, and speaker at the Symposium on *The Industrial Atmosphere* at the Society's 58th Annual Meeting in St. Louis, was chosen by the *Technical and Scientific Societies Council of Cincinnati*, Ohio, to receive the Council's annual award at the joint meeting held at Taft Auditorium, February 19, as announced by H. B. Welge, chairman of Council and of its Board of Judges.

Dr. Kehoe was selected as Cincinnati's *outstanding engineer for 1952*, because of his accomplishments in the study of heavy metal poisoning and because of his pioneering activities in the field of education in industrial health. The problem of lead toxicity first came before Dr. Kehoe during his early years in the physiology department of the College of Medicine, with the discovery of tetraethyl lead as an anti-knock compound for use in gasoline. It was chiefly through his extensive studies that adequate safety controls were developed to permit the manufacture and distribution of this product.

R. A. Kehoe, M.D.
Cincinnati, Ohio

This achievement proved to industrialists that it was essential that a thorough toxicologic study of new chemical compounds be made prior to their general use, and this in turn led directly to the establishment, by the industry, of the Kettering Laboratory as a part of the College of Medicine, at the University of Cincinnati, with Dr. Kehoe at its head since its founding in 1930.

Among the many honors bestowed on Dr. Kehoe, the most significant, perhaps, was the Knudsen Award presented to him in 1949 by the *American Association of Industrial Physicians and Surgeons*, awarded for his distinguished service in the field.


This paper is the result of research carried on by
THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
at its Research Laboratory located at
7218 Euclid Ave., Cleveland 3, Ohio

A V-Wire Direction Probe

By H. B. Nottage*, J. G. Slaby**, and W. P. Gojsza**
Cleveland, Ohio

SUMMARY — Construction and experience in use are reported for a simple type of direction-measuring probe developed for room air distribution research and employing remote operation and indication. Emphasis is given to the importance of direction as a necessary measurement for vector quantities such as velocity, momentum and force.

VELOCITY, momentum and force are vector quantities of experimental importance in room air distribution, requiring both a magnitude and a direction to become completely specified.

Instrumentation has been an important aspect of the long-range program on room air distribution[1,2,3] being conducted at the ASHVE Research Laboratory with the guidance of the Technical Advisory Committee on Air Distribution†.

Experience and construction features are reported here for a simple remote-indicating direction probe, developed for two-dimensional use in free streams, whose sensing element is a fine platinum-iridium wire in the form of a *V* supported on three needle points and carrying a heating current as part of a bridge circuit. This device has been found well suited to the lower velocity range where aerodynamic direction probes, responding to impact pressure, become difficult to use because of: (1) the very small magnitude of the impact pressure, (2) the considerable time required to obtain a pressure balance with pressure lines of appreciable length and only a small pressure difference available, and (3) the fluctuations present in turbulent shear flow.

Probe Principles and Circuit

The rate of convective heat loss from a fine wire in a fluid stream will vary with the angle between the wire axis and the stream velocity. This fact might permit a single electrically heated wire to be used as a direction meter; but a simpler and more reliable arrangement, suitable for two-dimensional plane flow, is to employ two closely identical wires mounted in the form of a *V*. This permits direction determination based upon a very easy *comparison* measurement between the two wires when they are made part of a bridge circuit. A single fine wire is subject to undesirable changes in its characteristics with use, but the relative change between two similar wires will be much smaller. Simmons and Bailey have reported a similar device.[8]

Fig. 1 shows the circuit employed. The circuit constants noted there are not critical and merely represent one combination which has proven successful.

In use, the *V* is pointed into the oncoming stream as in Fig. 2. If the *V* has been properly zeroed, both electrically and mechanically, the position of the bisector of the *V* angle will coincide with the stream

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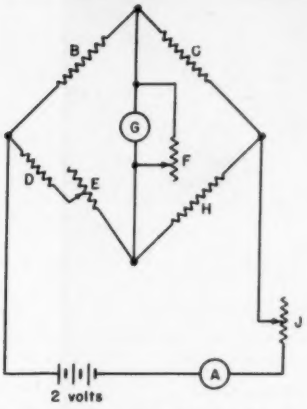
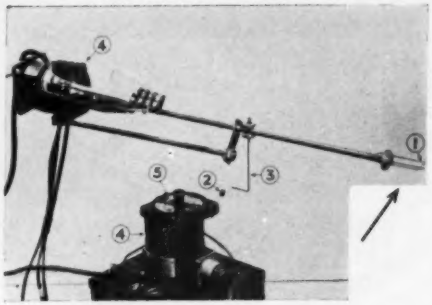
Presented at the 58th Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, St. Louis, Mo., January 1952.



A = Ammeter, set at 0.4 amps (for convenience)
B, C = Platinum — Iridium V wires
D = Resistor, 20 ohms
E = Rheostat, 8 ohms
F = Rheostat, 2 ohms
G = Reflecting galvanometer, nominal sensitivity 0.61 μv/mm, resistance 52 ohms
H = Resistor, 20 ohms
J = Rheostat, 20 ohms

Fig. 1—Circuit for V-wire probe

Fig. 2—V-wire aligned in plane of flow to give stream direction from the direction of the bisector of the V



(1) V-wire on needle points
(2) Plumb line
(3) Pointer for plumb reference setting
(4) Selsyn motor
(5) Angle scale

Fig. 3—V-wire probe attached to Selsyn motor

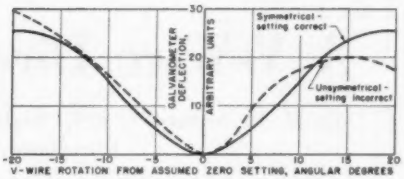


Fig. 4—Symmetrical-response basis of setting the V-wire zero

direction when the galvanometer (Fig. 1) shows zero deflection.

Fig. 3 pictures a probe attached to a Selsyn motor, thereby providing convenient remote positioning.

Many variations are possible from the basic idea. The particular *V* under discussion is formed from platinum — 10 percent iridium wire of 0.002 in. diameter, mounted on needle points with an included angle of 30 deg, and having sides 0.50 in. long. Comparative tests of *V*'s of different sizes showed this combination to be best for the particular flow phenomena being studied and the circuit employed. *V*'s with sides 0.25 and 0.75 in. long showed a much less stable galvanometer balance.

Setting the Zero

Making both sides of the *V* identical, mechanically and electrically, is impracticable; fine platinum wires are known to experience changing heat-loss characteristics in service as a consequence of aerodynamic or other forces, solder-contact variations, and accumulations of surface deposits from the air. A convenient electrical compensation and relatively simple zeroing of the direction angle therefore are important.

To set the zero, a uniform stream is needed, preferably of known direction which is most conveniently either horizontal or vertical. The procedure then is as follows, assuming the stream direction known, and working with the probe shaft horizontal:

1. Place the *V* in the stream with its bisector aligned with the stream direction; close the circuit and *balance electrically* to zero the galvanometer, and then set the Selsyn angle indicator at zero for a first trial.

2. Rotate the *V* in both directions from this position, and plot observed galvanometer deflections vs. angle of rotation as in Fig. 4.

3. If the above curve is perfectly symmetrical, the zero setting and electrical balance are correct. If not, shift the Selsyn setting a few degrees and repeat the electrical balance, continuing the process until a symmetrical curve is obtained, whereby the Selsyn zero is finally established on the basis of the known or assumed stream direction.

4. The zero position of the probe shaft then is referenced to the vertical with the aid of the plumb line and the adjustable set-screw indicator shown in Fig. 3. This permits the Selsyn motor zero to be re-set relative to the shaft at any future time.

Unless the direction-calibration stream has had its direction definitely established by independent means, the angle zero still may be inaccurate despite the symmetry of Fig. 4. In this case, further steps are necessary to determine the true direction of the calibration stream, as follows:

1. With the Selsyn reference angle set as above, rotate the entire assembly (motor and shaft) through 180 degrees about the tip of the *V* as a fixed point, *keeping the shaft in a plane perpendicular to the assumed stream direction.* This interchanges the two sides of the *V* as noted in Fig. 5.

2. If the galvanometer balance is maintained in the new position, the assumed

OC = Assumed stream direction for V-wire position AOB

OC' = Indicated stream direction for V-wire position B'OA' (with sides of V interchanged)

OC'' = True direction of stream

Fig. 5—Determination of true stream direction for zero setting of direction-angle scale

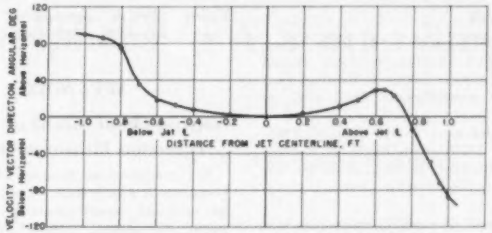


Fig. 6—Illustrative direction traverse across the vertical diameter of an isothermal air jet discharging horizontally from a 6-in. nozzle

Distance from outlet = 3.5 ft
Average outlet velocity = 2500 fpm

stream direction is correct. If not, the angle of Selsyn rotation to produce balance should be determined.

3. The true stream direction is given by the bisector of the angle between the initially assumed direction and the new balance position from (2) above, as diagrammed in Fig. 5. The Selsyn scale setting should be readjusted accordingly to zero the V in the true stream direction. The plumb indicator also is re-set as necessary in order to give an absolute shaft position reference to probe direction measurements.

If the adjustments above have involved shifts of more than 2 or 3 deg, a repeat checking is advisable. Experience has shown that the procedure outlined yields zero settings to about $\pm$ 0.5 deg when performed only with very simple equipment, which precision is adequate for the intended use.

Use of Probe

The instrument described has been developed for use in free streams. The velocity range covered has been from 6000 fpm to roughly 50 fpm. The low-velocity limit is primarily in the nature of free-stream flow rather than the principle of the probe, as long as there is no free-convection interference between the sides of the V. In free turbulent air streams at low velocities, large-scale whirls, billows and surges are encountered which make the V-wire principle impracticable for tracing streamlines.

The dimensions of the V serve as a limitation upon the streamline radius of curvature which may be followed. The V is intended for use in a region wherein the velocity vectors at all points within its dimensions have essentially the same magnitude and direction. The ½-in. V, however, thus far has proven adequate for its intended use in room air distribution research.

Steep velocity or temperature gradients are to be avoided, for a difference in either air temperature or velocity between the sides of the V will distort the indication of bridge-circuit balance.

Two methods of use have been employed: (1) setting the probe in position and rotating the V to balance the galvanometer, and (2) setting the V angle and traversing the entire probe assembly to locate the position of galvanometer balance. Convenience dictates the choice.

The following precautions are suggested: (1) zeroing should be checked on a schedule established by experience, (2) the Selsyn motor must not be allowed to accidentally slip a pole position, and (3) spurious indications must be guarded against in V positions 90 or 180 deg out of alignment.

The instrument might be made self-rotating to indicate automatically the balance position angle, if desired, employing a procedure based upon the bridge-circuit balance.

Extension to a three-dimensional design is possible, should such be warranted.

Illustrative Application

Fig. 6 shows a direction traverse across an isothermal air jet discharging into a large but finite space. The velocity-magnitude traverse corresponding thereto was more nearly symmetrical; but the lack of directional symmetry means that, despite apparent close magnitude symmetry, *the true velocity-vector profile is not symmetrical.* This observation is of broad significance.

The dissymmetry of Fig. 6 originates in environmental influences upon jet-entrainment flow, *e.g.*, differences in the surrounding air movement or positions of the confining surfaces. Nearly all practical ventilation jets are subject to dissymmetries of some sort, and a fundamental understanding requires complete velocity-vector data.

Conclusions

The remote-reading V-wire direction probe has established itself as a useful instrument in ASHVE room air distribution research.

Complete experimental data require that directions be measured for vector quantities.

Acknowledgment

D. A. Huebscher, formerly Instrument Maker at the ASHVE Research Laboratory, is to be credited with the fabrication, assembly and proof-testing of the V-wire direction probe. Helpful preliminary information on V-wire characteristics was obtained from the former *Daniel Guggenhiem Airship Institute*, Akron, Ohio. This paper is based upon part of a thesis submitted to the Graduate Faculty of Case Institute of Technology by the senior author; the guidance of Professors G. L. Tuve, S. D. Black and L. G. Seigel is gratefully acknowledged.

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APPENDIX

Note on Other Means of Velocity Direction Measurement

For completeness, mention of other instruments is appropriate. Todd[4] has given an excellent recent summary of aerodynamic instruments. The directional device described by him which employs the traversing of the wake behind a heated wire was tried for room air distribution research, but unfavorable complications caused it to be dropped in favor of the *V* wire.

For velocities in the range of easily-measured impact pressures, a cylindrical yaw probe (for two-dimensional flow) has been used. This has the form of a cylindrical tube with pressure-tap holes drilled at three positions on a circumferential arc. The two outer holes are located at ± 50 deg from the center hole. The center hole will give the magnitude and direction of the velocity vector when the tube axis is perpendicular to the flow and when there is zero pressure-difference reading between the two outer holes. This principle has been extended to a three-dimensional design employing holes on a small sphere.

For low velocities, say below 50 fpm, and also for obtaining a picture of room-air movement, smoke trails have been employed. Ammonium chloride has been a successful smoke for this purpose. With patient and careful work, using a darkened room and spotlights, smoke-trail directions at velocities as low as 10 fpm have been obtained. This technique remains for future reporting in detail.

ASHVE MEMBERS IN NEW POSTS

S. J. Levine has been appointed general manager of the new home heating and cooling department, and H. M. Brundage has been named general manager of the new heat pump department in General Electric Company's Air Conditioning Division, Bloomfield, N. J., as announced recently by F. J. Van Poppelen, general manager of the Division. Both are members of ASHVE.

Mr. Levine has been engaged in engineering design since joining the company in 1928, and has been with the Air Conditioning Division since 1934. A graduate of MIT, he also completed the Advanced Management Course at Harvard Business School.

Mr. Brundage came to General Electric in 1948 as manager of the automatic heating department of the Air Conditioning Division, and has been active in planning the commercial introduction of the packaged heat pump and the residential summer air conditioner. A native New Yorker, Mr. Brundage is a graduate of Stevens Institute of Technology. Before joining GE he headed his own heating equipment and appliance business in Richmond and Norfolk, Va., and during the war he served with the War Production Board and as regional director of the Small War Plants Corp.

BOILER CODE COMMITTEE MEET IN CANADA

The first meeting of the *ASME* Boiler Code Committee is scheduled for April 24-25, 1952, at the Royal York Hotel, Toronto, under the sponsorship of the International Council of the *American Society of Mechanical Engineers* and the *Engineering Institute of Canada*.

This Committee is composed of a group of technical specialists who have been meeting regularly under the auspices of the *ASME* for many years, and it has been their responsibility to establish and maintain the engineering standards applying to the manufacture, installation and operation of all items of mechanical equipment which are subject to fluid pressure. These standards are now accepted generally throughout the United States and Canada as well as in many other parts of the world.

The *Canadian Standards Association* has maintained close liaison with this Committee for some years in developing Canadian standards and specifications for the design and manufacture of power and heating boilers, as well as unfired pressure vessels, piping, and accessories.

John R. Allen Memorial Library

The ASHVE Committee on Research gratefully acknowledges the gift of 23 pamphlets from Dr. Aldo Gini of Milan, Italy, to the John R. Allen Memorial Library, which is maintained at the Society's Research Laboratory, 7218 Euclid Ave., Cleveland 3, Ohio.

These pamphlets, written by Dr. Gini, are in Italian, cover various phases of heating, ventilating and air conditioning, and represent the personal contributions of Dr. Gini to the literature. Dr. Gini, who is a consulting engineer, has been a member of the Society since 1933. He attended the Semi-Annual Meeting in 1951 and spent some time at the Society's Research Laboratory, where he discussed with staff members some of his experiences, particularly those in the field of panel heating.

The presentation of textbooks and pamphlets in the field of heating, ventilating, and air conditioning and allied fields, by authors and others, will be welcomed by this library. Suitable bookplates carry the name of the donor and date of the gift.

The Industrial Atmosphere — A Symposium*

Part I

Dean L. E. Seeley, Presiding **W. N. Witheridge, Moderator**

The subject, The Industrial Atmosphere, was announced by L. E. Seeley, president of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS as follows:

Today's session introduces a panel discussion on a very important and interesting subject. It will be conducted by W. N. Witheridge, Detroit, who will act as moderator. He will present the four members of the panel and it gives me a great deal of pleasure to introduce Mr. Witheridge.

MODERATOR WITHERIDGE: The Society's Technical Advisory Committee on Industrial Ventilation recognizes the importance of *The Industrial Atmosphere*, and we are pleased that by your presence you have expressed this gratifying interest in our subject. It is hoped that this session will prove to be a contribution to better communication and understanding among engineers, between engineers and the allied professions such as the medical profession, and also between the engineers and the general public.

We believe that you will be impressed by the fascinating variety of the problems we encounter in the industrial field. We want you to hear the specialized language of this field, but we have tried to omit the highly technical aspects of our problems.

After this meeting it is hoped that many of you will have a better understanding of our industrial problems and viewpoints, and that in the course of your future activities and work you will be conscious of some of the difficulties and perhaps even dilemmas which we occasionally face.

A year ago, the Society held a symposium on *Man and His Relationship to Air*. In this symposium we have added the complication of requirements for man at work and the requirements for the products which he manufactures.

The subject will be discussed from the viewpoints of (1) the industrial engineer who must reconcile many conflicting requirements, presented by H. A. Mosher; (2) the industrial architect who must find space for more and more equipment and, at the same time, satisfy the architectural artists, presented by A. T. Waidelich, who has as a collaborator, W. A. Hunting; (3) the equipment supplier who has to translate the sometimes rather rigid requirements into practical as well as economical equipment, presented by R. P. Warren†; and (4) those who work in and live near industrial operations, presented by R. A. Kehoe†, M.D.

• W. N. WITHERIDGE — Ventilation consultant, Central Office Personnel Staff and Research Laboratories Division, General Motors Corp. He has graduated from the General Motors Institute, Michigan State College, Harvard University School of Public Health, and received his Ph.D. from the University of Michigan in 1950. A member of the Society since 1944, he has served on several TACs and as chairman of the 1950 GUIDE Publication Committee.

Integration of Process and Human Requirements

By H. A. Mosher, Rochester, N.Y.

IN A SYMPOSIUM such as this, a discussion of integration of process and human requirements in industry today must necessarily be made in terms of broad generalities, since the tremendous variety of situations encountered precludes the possibility of treating even one of them in great detail. Perhaps some concept of the scope of the problem may be gained from consideration of a few statistics which follow.

Figures of the *Bureau of Census, U. S. Department of Commerce*, for the year 1947, and other reliable sources, indicate that, in an average day, America's vast industrial machine mines and burns over 1-1/3 million tons of ash-producing fuel; it mines, manufactures, and uses about ½ million tons of various metals and minerals; it manufactures, and uses, in a single day, over 4000 tons of chemical solvents in a multitude of dissolving, drying, and related operations; it manufactures and uses in that same day over 50,000 tons of other liquid chemicals and nearly 40,000 tons of dry and powdered chemicals. It uses daily in excess of five billion gallons of water, nearly seven million gallons of lubricants, and its endless cutting and abrasive operations create an estimated 5000 tons of waste each day.

Only a tiny fraction of these astronomical quantities of materials actually finds its way, in the form of particulate matter,

*Panel discussion conducted at 58th Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, St. Louis, Mo., January 1952.

†Part II to appear in the May JOURNAL.

• HAROLD A. MOSHER — Head, Dept. of Building Design, Eastman Kodak. Received B.S. from Occidental College. Following four years with Bell Telephone, he joined Eastman Kodak in 1934. He supervises design of buildings, machines, and equipment for the manufacture of photographic paper in all its phases, from paper pulp to finished sensitized sheets.

mists, vapors and gases, into the atmosphere which is so vital a part of the workers' environment. The engineer who is concerned with the control of pollution of industrial atmospheres, is only too well aware of the challenging problem to the well being of the industrial worker caused by even that tiny fraction. The problem is accentuated by other elements commonly referred to as *contaminants* of the industrial atmosphere, namely, sensible, latent, and radiant heat. For example, most of the 600 million kwhr of electric energy generated and used each day to light industry's factories, and power its machines and equipment, ultimately adds about 100 billion Btu per hour of usually unwanted heat to the atmosphere surrounding the worker.

The engineer in industry seeks to design and specify plant processes and equipment that will minimize the adverse effect of air contamination on the safety and health of the worker, or on production and employee comfort. In addition, the design should permit economical recovery of valuable wastes, or safe and convenient disposal of unwanted waste materials. These are the objectives of the ASHVE Technical Advisory Committee on Industrial Ventilation, namely, to aid in (1) reduction in health hazard, (2) reduction in safety hazard, (3) improvement in production conditions, (4) improvement in comfort conditions, (5) economical materials recovery, and (6) effective atmospheric waste disposal.

Air pollution resulting from the sources previously mentioned might be regarded as the by-product of the processes of industry. To what extent do the processes themselves require that the pollutive forces be corrected or mitigated? The answer varies with the process and industry. In many cases, such as some steel mills and foundries, atmospheric conditions have no effect upon the process, and the operations proceed in an environment resulting from an equilibrium between the rate of evolution of contaminants and the purging effect of natural ventilation or other forces.

In other cases, corrective forces are required as an integral part of the process equipment, either because of public codes protecting the health and safety of the worker, or because of requirements of the process itself. As an example of the latter, the optical and precision machine industries often require the ultimate in clean air conditions, at a controlled temperature and sometimes, humidity, to maintain close dimensional tolerances.

Likewise, the textile, photographic, and other industries using hygroscopic materials demand close regulation to an optimum temperature and relative humidity for control of product quality and manufacturing techniques. Candy making and food industries are other examples where the atmosphere must be meticulously controlled for optimum manufacturing conditions.

A broad and brief resume of the requirements of the process has been given. What, then, are the human requirements of workers in industry? Here again the answer must vary. Ideally, the industrial atmosphere would provide optimum comfort conditions to the worker in regard to thermal conditions, would offer no offensive odors, and would present no hazard to his health or safety. At the opposite end of the scale, employers may discharge their legal obligations to workers by adhering strictly to codes which define the maximum allowable concentrations of noxious vapors or gases, or which prescribe permissible conditions of operation for processes potentially injurious to the health or safety of the worker.

On the whole, any definition of the *human requirements* is as much a social problem as a medical or an engineering problem. Social gains made by industrial populations in this country during the past four decades have resulted in the acceptance by management of standards of working environment which lie between the two extremes cited, and which were economically and competitively impossible earlier.

How well can these loosely defined human requirements and those often adverse ones of the *process* be combined in an integrated, working design? The question can best be answered by considering it in three separate aspects:

1. In those areas where the requirements are dominated by those of the process, either by virtue of insurmountable technical problems, or because of overwhelmingly prohibitive cost of corrective measures, *i.e.*, some mining and steel industries. Here corrective measures must await technological improvements in the processes themselves, or improvement in corrective methods. There has been progress in this field in the past and the trend is toward further improvement. Certainly one great factor in this trend is the wider realization that contamination of working environments by radiant heat is not

Table 1—Response of Workers[a] to Various Levels of Atmospheric Contamination Due to Heat

Condition	Effective Temp.	Worker Response
A	71 ET	90% of subjects comfortable
B	75 ET	50% of subjects comfortable
C	80 ET	No subjects comfortable
D	85-90 ET	Maximum recommended level to avoid harmful physiological effects.

[a]Moderately active workers—500 Btu/hr metabolic rates.

susceptible to treatment by conventional air conditioning or ventilation means. The application, in hot industries, of radiant screens arranged so as to avoid undue interference with production, should and will receive more widespread consideration in the future.

2. In operations where the human and process requirements coincide, there are no engineering problems which require other than conventional treatment.

3. Into this category fall all those applications in which the conditions resulting from the process do not provide an environment suitable to the

Table 2—Effect on Workers of Various Levels of Atmospheric Contamination Due to N-Butyl Alcohol

Condition	Concentration	Worker Response
A	10 ppm	Negligible irritating effect Slight pungent odor
B	25 ppm	Mild irritation of nose, throat & eyes in 3-5 min exposure[a]
C	50 ppm	Pronounced irritation of nose, throat & eyes. Mild headache in some cases.[a]
D	100-200 ppm	MAC by code in most states. Physiologically safe.

[a]*Industrial Hygiene and Toxicology*, Patty, Vol. II, Chapter 26.

human requirements, but where the human needs could be met at reasonable cost without adversely affecting the process.

There seems to be a definite trend in industry toward providing these more desirable environmental conditions wherever possible; this trend growing out of a conviction on the part of many managements that a comfortable atmospheric environment pays dividends in terms of better personnel relations, employee satisfaction, and in many cases, increased worker efficiency.

Unhappily, however, in a too large number of operations in this third category, the human requirements, even though ca-

pable of being satisfied at reasonable cost, are compromised either to the limit allowable by legal obligation, or to the limit of public toleration. It is in this latter area that the enterprising and imaginative engineer in industry, as well as our own Society, can make the greatest contribution. There is much opportunity in industry today for the promotion of practices, all within the framework of sound business economics and policy, which define optimum standards of safe, comfortable, healthful, efficient atmospheric environment, as opposed to standards defining the maximum allowable levels of pollution.

As examples of this latter concept, two tables have been prepared showing the response of workers to various levels of atmospheric contamination due to excess heat (Table 1) and to N-butyl alcohol (Table 2).

In considering Table 1, condition A has been widely publicized as an optimum comfort condition. Condition D, likewise, is generally known, though not always used as a limit. The areas between these two conditions, however, have been regarded vaguely as a zone of compromise, in which engineers have been willing to accept whatever condition finally obtained, with but little effort to ascertain quantitatively what the effect on worker response would be. It is suggested that more study in this area would be in order, with the goal in mind of defining some optimum standard of acceptability for industrial workers.

Referring now to Table 2, it probably is safe to say that an overwhelming majority of engineers, faced with a problem in atmospheric contamination due to a N-butyl alcohol condition, would base their design on the maximum allowable concentration as defined by law in their state, which would permit concentrations of 100-200 ppm. However, as indicated in Table 2, and as those who have encountered this problem will know, a system designed on this basis will leave much to be desired in fulfilling the human requirements of workers thrust into such an environment.

Obviously, there must be a place in our sources of engineering information for data defining the danger limits from a physiological standpoint, but it seems to the speaker that there should equally be a place for scientifically determined data defining standards of acceptability which will be in keeping with the dignity and well being of the individual. Only thus will our engineering standards keep pace with the social growth of the nation.

In summary, then, there are vast forces at work each day in our industrial scene, contaminating and polluting the air which is probably the most vital part of the workers' environment. In some cases, these pollutive forces, because of technical or economic reasons, cannot be wholly overcome. Development of new processes, new methods, and personal ingenuity on the part of the engineer are the only means of solution in this area. In other cases, the requirements of the process and those of the individual are virtually the same, and the adjustment is ideal. In the remaining areas, the process and human requirements are adverse to each other, but the engineer may design for conditions which are either ideal, or which represent acceptable compromise. To aid in this direction, however, he needs the help of standards defining acceptable environmental conditions. Your speaker believes this Society can be helpful in promoting this information.

Effect of Atmospheric Requirements on Industrial Architecture and Plant Layout

By A. T. Waidelich and W. A. Hunting,* Cleveland, Ohio

As an introduction to the effect that requirements for the control of industrial atmosphere have had on the architecture and layout of industrial plants, it may be helpful to review briefly the evolutionary steps followed in design of industrial plants.

Our earliest industrial plants are well typified by the New England mill-building structures which were three or four stories high, about 50-ft wide, and several hundred feet long. They were a very logical solution for a period when masonry and timber were the only structural materials and when the only adequate lighting was natural daylight.

Work areas could be daylighted only by limiting buildings to about a 50-ft width. To secure large areas it was reasonable to use a number of stories. Multi-storied plants also permitted simple transmission of power by shafting and belts from a large steam engine or water wheel.

The interior was a forest of columns, usually two rows, with the posts in each row about 8 ft apart. The floor beams rested on these posts and on pilasters in the masonry walls and there was one window between each pilaster.

With the advent of structural steel it became possible to eliminate most of these posts and to use long spans provided the steel need carry only the roof and not floor loads. At the same time it was realized that very substantial improvements in production efficiency and material handling could be secured with industrial plants laid out entirely on one level. Since that time, the majority of the large new industrial plants have been of the single-story type with which most of our discussion will deal.

Daylight was still necessary for the early single-story plant and was introduced into the interior work areas through sawteeth or monitors. The use of steel to support the roof removed the necessity for masonry bearing walls and therefore the sidewalls consisted principally of large areas of continuous sash.

Ventilation of the New England mill building was accomplished by opening of windows. In the single-story plant, ventilation was provided by vented units in the sidewall sash and in the monitors and sawteeth. For many types of industry this form of ventilation was not adequate, and improvements were effected by using heat valves, power-driven roof ventilators and

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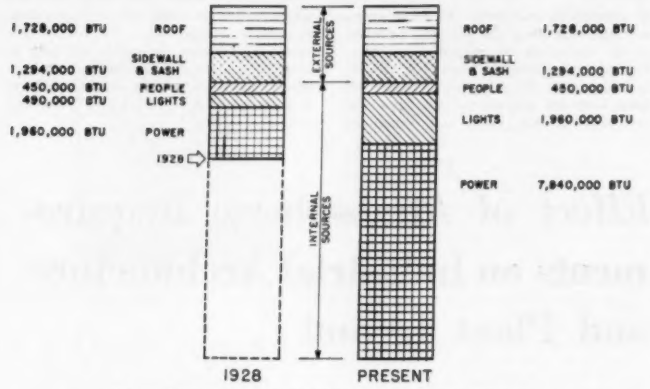

Fig. 1—Sources of heat in a typical monitor type building

exhaust systems serving special areas or individual machines which were particularly bad sources of contamination. But these advances were generally utilized only to improve what were essentially intolerable conditions. Conditions that were undesirable, but tolerable, received little attention.

Paradoxically, the one event that probably did the most to spur improvement of atmospheric conditions inside industrial plants, was — not air conditioning — but the development of a practical fluorescent lamp. Although practical systems of air-conditioning were available prior to the advent of fluorescent lighting, their use in industrial buildings was heavily penalized by the heat load from the large expanses of sidewall sash and numerous monitors or sawteeth. Yet all this sash was necessary for daylighting, since high-intensity lighting with incandescent lamps was both costly and added tremendous quantities of heat to be removed by the air-conditioning system.

The development of the fluorescent lamp was instrumental in providing a different approach to the design of buildings. This type of lamp gave good quality lighting and the amount of heat generated by it was small in comparison with the incandescent lamp; therefore, current consumption even at reasonably high intensities was relatively low, and it is now customary, regardless of the type of construction, to burn these lamps for the duration of the occupied period.

Now, what has caused a growing concern with the industrial atmosphere?

As the preceding speaker has so ably pointed out, the original concern with industrial ventilation was with those cases where the process created intolerable or harmful atmospheric conditions; there just *had* to be some relief.

The next group of industries whose working atmosphere received attention were those with processes or products that were adversely affected by high temperature or humidity, such as food plants, printing plants, and textile plants. Here improved atmospheric conditions yielded a definite economy in operation; hence there was every incentive to effect this improvement. This is the *happy* case where human and process requirements coincide. But, as stated by Mr. Mosher, the really big field for the improvement of atmospheric environment lies in those industries in which the atmosphere is suitable for the process, but *in which the human requirements — even though capable of being satisfied at reasonable cost — are compromised either to the limit allowable by legal obligation, or to the limit of public toleration.*

There are indications that the limits of public toleration decrease every year. Furthermore, every new plant that is built with improved working conditions puts its older neighbors at a disadvantage in competing for the best available labor.

Each year, a larger percentage of the industrial plants with which the speaker is concerned are equipped to obtain improvements in working conditions which are in excess of those required legally or for process needs alone. And this trend will be accelerated, as engineers devise better and less expensive means of accomplishing this improvement.

In this brief statement, time will not permit consideration of the removal of dust or vapors from special machines or sources of marked contamination. Consideration will be given only the atmospheric conditions in the normal, light or medium manufacturing plant, where the basic improvement will be the prevention of high temperature or high humidity.

In the monitored single-story plants, some relief of these oppressive conditions was expected from the movement of outside air across the tops of the monitors

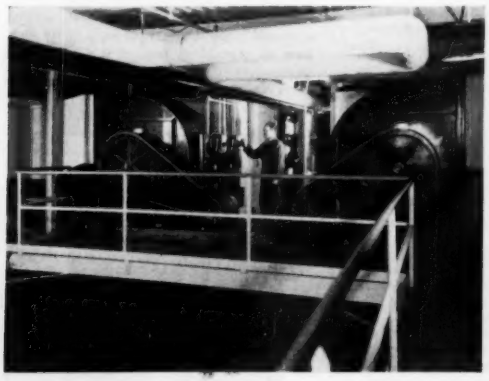

Fig. 2—Air conditioning equipment in truss space of textile plant

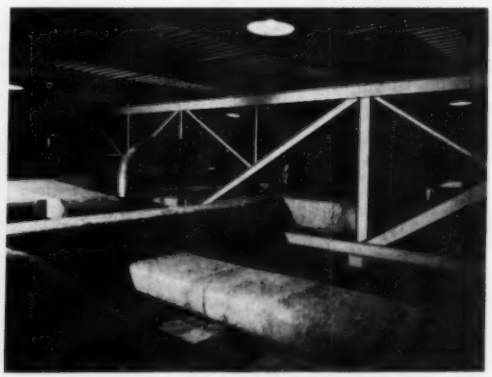

Fig. 3—Duct work in truss space above ceiling of pharmaceutical plant

inducing a circulation within the plant. Earlier books on plant design emphasized the importance of proper orientation of the plant so that the prevailing winds would most effectively induce this circulation. However, this theory has not been substantiated by the results. Even when the wind is blowing in the proper direction, in large plants there is little circulation near the working level, due to short-circuiting at upper levels. Usually, only the men near the windows receive any benefit. But worst of all, on the hot, extremely humid days, when conditions are most oppressive and there is little or no breeze, natural ventilation fails completely.

It is our opinion that in the *large* industrial plant, so-called *natural ventilation* is, at best, a hit-or-miss, ineffectual operation. Even in the northerly industrial cities, such as Chicago, Detroit and Cleveland every spell of hot summer weather causes a number of plant walk-outs by employees who insist that it is too hot to work in naturally ventilated plants. What particularly aggravates this condition is that the temperature within the plant can be considerably greater than the outside temperature. A comparison of the sources of heat in typical modern industrial plants shows that it is common to have over three times as much heat produced by sources *inside* the plant as from sources *outside* the plant. Therefore, it is obvious why the temperature within a plant can be higher than that outside.

This was not always true; twenty-five years ago the heat from internal sources was usually about equal, or less, than the heat from external sources. But the rapid introduction of more, heavier and faster production and handling machinery has more than tripled the power (see Fig. 1) used by similar plants then and now. It is small wonder that the older plants, for which natural ventilation previously seemed adequate, are now confronted with serious complaints from their employees.

There has been a similar large increase in the heat input from lighting. In 1926 a lighting load of one watt per square foot would have been higher than average. Today three or four watts per square foot is not uncommon for new plants.

The fact that in the summer the bulk of the heat is produced within the plant suggests that a desirable type of plant might be one with a minimum amount of walls and roof in order to let the heat escape. This is actually a recognized type of design in tropic and semi-tropic regions. In this country, however, plants must be heated in the winter, and a well insulated building is essential for economical heating, even though it works against the objectives in hot weather.

Another conclusion is that since three-fourths of the heat load is internal, a positive means of circulating outside air *at the working levels* inside a plant will produce an improvement in the atmospheric environment, which is intermediate between outdoors and that which would exist in the plant without this positive ventilation. Which of these limits is approached depends upon the quantity of air that is circulated through the plant, and this discharge rate will affect the cost of the installation and operation of the ventilating system.

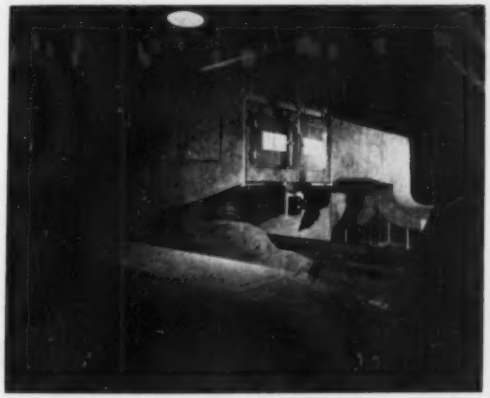

Fig. 4—Sterile lamps installed in air conditioning system above ceiling of pharmaceutical plant

The effects of these considerations on the design of the plant will now be treated. As far as the roof and walls are concerned, the most economical solutions include a flat insulated roof which in some instances, is provided with a spray system, and an unbroken insulated wall without sash. If desired for aesthetic or psychological reasons, a small amount of sash can be used in the walls — at some increase in cost.

Such a plant requires positive mechanical ventilation. A simple means of accomplishing this is to install fans in the roof trusses, as shown in Fig. 2. These fans draw in outside air, through filters, and distribute it through a simple system of ducts. The air is discharged from the buildings through relief dampers or motor-driven ventilators.

The most economical layout for such a system is to divide the building into a number of similar areas, each of which is served by one such system. This not only minimizes duct work but keeps the equipment small and gives the economy of maximum duplication. It also permits the independent control of the conditions in each area, which is necessary to produce a relatively uniform environment despite local variations in the heat load.

This same positive ventilating system can also be used for winter heating, by introducing heating coils into the air supply system.

For economy, provision may be made for automatically recirculating a portion of the warm air.

It must be remembered that the positive ventilating and heating system just described will not produce perfect conditions inside the plant. In extremely hot weather it will be hot in the plant, but not so hot as it would be with ineffectual natural ventilation from windows and sawteeth or monitors. Furthermore, this system will provide a means of easily flooding the plant with the cooler air at night, thus delaying the build-up in temperature during the day.

It is most surprising that, in general, the plant just described can be built *and* operated for about the same cost, or even slightly less, than the more conventional plant with sidewall sash and sawteeth or monitors. The additional first cost of the mechanical equipment is balanced by the savings due to elimination of the sash and sawteeth or monitors. The additional operating cost of the mechanical ventilation is balanced by the savings in fuel during the heating season.

This type of plant may be called the *convertible building*, as it can be easily converted to produce even better atmospheric environment by adding cooling and dehumidification equipment which fits rather simply into the original ventilating and heating system, and can be added years after the plant is in operation.

Again, a considerable degree of flexibility is possible. If desired, certain of the unit areas can be cooled and dehumidified while other areas receive only simple ventilation. Another possibility, in the interest of economy, is to add cooling and dehumidification for the whole plant but *less* than would be required for complete control of atmospheric conditions. Thus the maximum temperature and humidity conditions would be lower than with the positive ventilation alone, but the control of the atmospheric environment would not be as complete — or always as satisfactory

— as with the installation of the full cooling equipment.

Such a compromise has been successfully accomplished in a new plant near Cleveland. Partial cooling and dehumidification are combined with ventilation. In this instance, in order to have the employees receive the maximum benefit from the conditioned air, it is introduced into the space at eight feet above the floor. The effectiveness of this method of introducing the air was demonstrated by smoke tests, which confirmed the fact that a blanket of cool air can be obtained in such a plant.

As was just mentioned, the ultimate in atmospheric control requires sufficient cooling and dehumidification equipment to handle maximum heat loads. There are now numerous examples of industrial plants so equipped. Historically, it is interesting to note that this ideal was realized over 20 years ago, with the construction of a controlled-conditions plant at Fitchburg, Mass. This plant was built specifically for two-shift operation and the working conditions were the same at night or day — and in summer and winter. More spectacular than the improvement in working conditions was the effect on the production layout: this plant really achieved straight-line production. Even the 70 heat-treating furnaces were located precisely where they belonged in the proper operational sequence.

A recent trend in the design of plants with controlled atmospheres has been to place all the heating, cooling and ventilating equipment on regularly spaced platforms at the level of the bottom chord of the roof trusses. This keeps the equipment clear of the valuable working floor and also keeps duct work to a minimum. With the present demand for wide column spacings of 40 by 60 ft, or 40 by 80 ft, the roof trusses have sufficient depth to permit all the equipment to be kept below the roof level, thus eliminating the need for pent houses.

On a number of projects, a further refinement in the construction procedure has been to assemble the equipment on the platform at the floor level, and then raise the platform into final position.

In very large plants with severe requirements for atmospheric control, the design of the air conditioning system can be quite complex. A recent pharmaceutical plant requiring 3,000,000 cfm is a good example. The many different, segregated operations required a wide range of controlled atmospheric conditions. Actually there were three basic atmospheric conditions: (1) a range about 80 F D. B. and 50 percent R. H., using well water; (2) a range about 75 F D. B. and 40 percent R. H., using chilled water; and (3) a range about 80 F D. B. and 10 percent R. H., using dehumidifying units in conjunction with well water or chilled water. Air from these three basic systems was then further modified locally to meet the specific conditions required for certain manufacturing operations. Sterile areas were supplied with air that was passed through electric precipitators and a sterile lamp plenum, see Fig. 4. There were also several areas that required the relative humidity to be maintained within limits of plus or minus one-half of one percent.

Even a brief discussion of industrial atmospheres is not complete without stressing the importance of the plant's location. As new plants are planned, their proper location should receive serious consideration. Most new plants are going to suburban locations where they can be landscaped attractively. The gain is not solely aesthetic: large areas of lawn surrounding a plant are important in keeping down dust, and so are paved driveways and parking areas.

Obviously a location in a smoky, dirty industrial area will impose additional problems in filtering the incoming air. A damp, humid region will impose additional dehumidification loads if a dry plant atmosphere is required.

The studies leading to the proper location of an industrial plant may be quite complex and in many instances, overall economy may necessitate location of a new plant in an otherwise undesirable climate. In such instances the mechanical engineer will have to modify the conditions artificially. But to the extent that other location factors permit, the climate and environment should receive careful consideration in the selection of the location of any new plant.

Undoubtedly, while the future will bring large strides in improved and more economical control of industrial atmospheres, the tools, knowledge, and the experience are now available to do a great deal more than has been done. It is hoped that this symposium will help spread this realization.

1952 GAS APPLIANCE SHOW TO BREAK RECORD

The largest exposition of gas appliances and equipment in the history of the industry is in prospect for October 27-31, 1952, according to a prediction by Harold Massey, exhibition manager of the *Gas Appliance Manufacturers Association*, which will sponsor the exposition in conjunction with the 34th annual convention of the *American Gas Association*. The exhibition will be held at the Auditorium in Atlantic City, N. J. Mr. Massey also announced that inquiries about space have been arriving in unprecedented volume and actual reservations are running far ahead of previous years.

The exposition has been held biennially by *GAMA* at the same time as the *AGA* convention. This forthcoming event will afford manufacturers an opportunity to acquaint dealers and key people in the gas industry with new developments in appliances and equipment.

In previous years, dealer activities at the exposition were limited to the last two days of the meeting, but this year, with the accent on selling and aggressive promotion, special dealer participation will be carried on throughout the five-day session. In addition, meetings of the Northeastern Section of the *Liquefied Petroleum Gas Association* have been arranged for October 30 and 31.

It is the belief of the *GAMA* exhibition committee that these activities will attract a greater number of promotion-minded dealers than ever before and that the value to exhibitors and the industry in general will be greatly enhanced.

The *AGA*, following through on the *accent-on-sales* idea, is urging increased attendance by utility representatives, particularly those who are active in the merchandising of gas appliances and equipment.

PRESIDENT SZEKELY VISITING WESTERN CHAPTERS

Following a meeting of the Council on April 5 at the Conrad Hilton Hotel in Chicago, Pres. Ernest Szekely departs for a West Coast trip and visits a number of Chapters en route. On April 7 he addresses the Inland Empire Chapter at Spokane and the Pacific Northwest Chapter at Seattle on April 8.

The new Chapter just chartered at Vancouver as the British Columbia Chapter of ASHVE holds its Charter meeting on April 9, and President Szekely will make the Charter presentation. He is then scheduled to address the 7th Oregon Air Conditioning Conference at Corvallis on the subject of *Pneumatic Conveying Systems* on April 11. Following visits to San Francisco, April 14, and Los Angeles, April 15, he will stop at Salt Lake City on April 17.

30TH EDITION OF THE GUIDE PUBLISHED

THE 30TH edition of the HEATING, VENTILATING, AIR CONDITIONING GUIDE 1952 shows an increase over previous editions in both usefulness and size. The Technical Data Section, which comprises 1064 pages of technical and design information on 50 different subjects, contains 32 pages of new material in the text section and 24 more pages of catalog data.

The chapter arrangement of the last two editions has been retained, the chapters being grouped under the seven familiar section titles: I—Fundamentals; II—Human Reactions; III—Heating and Cooling Loads; IV—Combustion and Consumption of Fuels; V—Systems and Equipment; VI—Special Systems; VII—Instruments and Codes.

While the entire book has been reviewed carefully and important revisions have been made throughout, special improvements will be noted in the following chapters:

In the chapter on *Heat Transmission Coefficients of Building Materials*, the section on water vapor and condensation in building construction has been rewritten and enlarged. Particular attention has been given to the discussion of visible and concealed condensation and to methods of preventing moisture damage in buildings. A number of new materials are listed in the tables of conductivities and conductances, and revised values are shown for previously listed materials where new data have become available.

Under *Heat Transfer*, the tables of unit conductances for thermal convection and methods for computing radiant heat exchange for various conditions have been brought into agreement with latest research results.

Average winter temperatures for October to May were obtained from the *U. S. Weather Bureau* and the *Canadian Meteorological Service* and are listed in the table of Winter Climatic Conditions for 316 cities in the United States and 16 Canadian cities in the *Heating Load* chapter.

Design tables for heat gain through flat glass and glass block have been simplified, and design tables for figured rolled glass

have been added in the chapter on *Cooling Load*.

The section on residential chimneys has been rewritten with special emphasis on the performance and selection of low-height chimneys for basementless and other low buildings. The information is based on *National Bureau of Standards* test results. A new chart for determining gas appliance vent and chimney sizes is included to show recommendations of the *American Gas Association*.

The sections dealing with oil and gas fuels have been rewritten and expanded to include more information on properties and combustion data for present day fuels.

Boiler rating information has been brought up to date and a new abridged table showing current $I=B=R$ boiler rating and sizing practice has been added.

The unit ventilator section has been rewritten in conformity with present practice in rating and installation. Several unit heater piping diagrams have been revised. Sections dealing with construction, ratings, operation and application of room coolers have been enlarged.

The information on baseboard type of radiation has been extended. Btu ratings have been added to the previous *Equivalent Direct Radiation* ratings of the currently manufactured sizes of radiators.

In the chapter on *Industrial Air Conditioning*, the table showing recommended air conditions for manufacturing, storing, and handling various types of products has been greatly enlarged, and many important factors affecting the processes involved have been listed with the various products.

The air filter section under *Air Cleaning* has been rewritten to provide more data on types of filters and dusts encountered. Information has been added describing the charged-media type of filter.

Under *Refrigeration*, the section on the absorption system has been enlarged to include a diagram and description of the lithium bromide-water absorption system.

Data have been added on application of fans for high temperature work. Nomenclature and designations for fans have been brought into accord with latest industry practice.

The list of codes and standards has been enlarged to include new codes of interest, and latest editions of all codes have been indicated. Names and addresses of organizations which can supply the codes and standards are listed for convenience in obtaining copies.

In the seven sections of the book there are 50 chapters dealing with the following subjects: I—Terminology, Abbreviations and Symbols, Thermodynamics, Fluid Flow, Heat Transfer; II—Physiological Principles, Air Conditioning in the Prevention and Treatment of Disease, Air Contaminants; III—Heat Transmission Coefficients of Building Materials, Infiltration and Ventilation, Heating Load, Cooling Load; IV—Fuels and Combustion, Automatic Fuel Burning Equipment, Heating Boilers, Furnaces and Space Heaters, Chimneys and Draft Calculations, Estimating Fuel Consumption for Space Heating; V—Gravity Warm Air Systems, Forced Warm Air Systems, Steam Heating Systems, Hot Water Heating Systems, Radiators and Convectors, Panel Heating, Unit Heaters and Unit Ventilators, Unit Air Conditioners and Unit Air Coolers, Pipe, Fittings and Welding, Pipe Insulation, District Heating, Central Systems for Air Conditioning, Air Distribution, Air Duct Design, Fans, Air Cleaning, Spray Apparatus, Air Heating and Cooling Coils, Refrigeration, Dehumidification by Sorbent Materials, Automatic Control, Motors and Motor Controls, Sound Control, Electric Heating, Corrosion and Water Formed Deposits — Causes and Prevention, Owning and Operating Costs; VI—Industrial Air Conditioning, Industrial Exhaust Systems, Industrial Drying Systems, Transportation Air Conditioning, Water Services; VII—Instruments and Measurements, Codes and Standards.

Large prints of the ASHVE Psychrometric Chart in two colors and the ASHVE

Air Friction Chart are included with each book.

This edition was prepared by the Guide Committee, composed of: P. B. Gordon, *chairman*, D. B. Anderson, Nathaniel Glickman, W. S. Harris, B. H. Jennings, W. E. Long, P. J. Marschall, F. J. Nunlist, Jr., C. D. Shields, Cyril Tasker, *ex-officio*, and Carl H. Flink, *technical secretary*.

Catalog Data Section

One of the special features of THE GUIDE is the larger Catalog Data Section which contains accurate data and specifications on the latest products of the 277 manufacturers whose catalog data can be found on pp. 1099-1485. For the convenience of finding available types of equipment there is a 32-page *Index to Modern Equipment*, printed on tinted stock. This index lists the names of the manufacturers, according to the various categories, and gives the page numbers on which their catalog data appears.

A cross index is provided for both the Catalog Data and Technical Data Sections.

The size of THE GUIDE is 6 x 9 in., bound in blue cloth cover, stamped in gold, and retains the familiar appearance. The price of single copies of this edition is $7.50.

NEW JERSEY CONSIDERS ATMOSPHERIC POLLUTION

The increasing concern of the public in the subject of atmospheric pollution, and the necessity of giving assistance to those who are confronted with the task of solving air pollution problems, were two prime factors in the origin of the Governor's Conference and Exhibit on Atmospheric Pollution held in Trenton, New Jersey, on February 19-20.

Original sponsorship for the meeting was provided by the New Jersey State Department of Health, which issued invitations to a considerable number of organizations to act as co-sponsors. THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS gave assistance through the Technical Secretary, Carl H. Flink, in organizing the technical program, and particularly in obtaining speakers for the session on *Air Pollution Control Equipment*.

Members of ASHVE who participated in the programs, and the subjects which they discussed, were as follows:

Air Pollution — Its Status Today, by Dr. A. D. Brandt (Bethlehem Steel Corp.)
Measurement of Air Pollution, by W.C.L. Hemeon (Mellon Institute)
Filters and Cloth Collectors, by A. C. Stern and Leonard Greenburg, M.D. (Div. of Industrial Hygiene and Safety Standards, N. Y. State Department of Labor)

The first session on February 19 was devoted to a consideration of the general aspects of atmospheric pollution. An informal discussion followed Dr. Brandt's paper, and covered the following aspects:

The Public Health Aspects, by Daniel Bergsma, M.D. (N. J. State Department of Health)
The New Jersey Aspects, by Senator F. L. Hess (N. J. Air Pollution Study Commission)
Agricultural Aspects, by Dr. R. H. Daines (Rutgers University)
Engineering and Physiological Aspects, by Dr. A. D. Brandt (Bethlehem Steel Corp.)
Legal Aspects, by F. L. Seamans (*Manufacturing Chemists' Association*, Air Pollution Abatement Committee)

The subject for the second session on February 19, was *Determining Effects of Air Pollution*. In addition to the paper by Mr. Hemeon, three papers were presented as follows:

Chemicals Involved in Air Pollution and Their Effects Upon Vegetation, by Dr. P. W. Zimmerman (Boyce Thompson Institute for Plant Research, Inc., New York City)
Health Aspects of Atmospheric Pollution, by Dr. Anna M. Baetjer (Johns Hopkins School of Hygiene and Public Health)
The Meteorological Factor in the Appraisal of Air Pollution Problems, by R. C. Wanta (U.S. Weather Bureau, Brookhaven National Laboratory, Long Island, N.Y.)

At the February 20 morning session, the subject considered was *Air Pollution Control Equipment*. The types of equipment available and the performance of such equipment were presented in four papers:

Performance of Inertial Collectors, by Dr. Leslie Silverman (Harvard School of Public Health)
Filters and Cloth Collectors, by A. C. Stern and Leonard Greenburg, M.D. (Div. of Industrial Hygiene and Safety Standards, N. Y. State Department of Labor)
Scrubbers, by C. H. Nichols (Merck & Co., Rahway, N. J.)
Electrical Precipitation as Applied to Air Pollution, by R. L. Chamberlin (Research Corp., Bound Brook, N. J.)

The fourth and last session on February 20 provided an opportunity for consideration of cases in which air pollution had been reduced by industrial cooperation. Representatives of manufacturers discussed the methods which were used in various plants located in populated areas. The papers presented were:

Plant-Wide Air Pollution Control, by R. J. Jenney (American Cyanamid Co., Bound Brook, N. J.)
Fly-Ash Disposal Problems and Costs, by G. F. Jenkins (Carbide & Carbon Chemicals Div., South Charleston, W. Va.)
Air Pollution Abatement in Tetryl Manufacture, by E. W. Schneider (E.I. du Pont de Nemours & Co., Inc., Gibbstown, N. J.)
Air Pollution Problems in a Fine Chemicals Plant, by I. R. Lewis (Merck & Co., Rahway, N. J.)
Controlling Fluorine Emissions, by A. B. Pettit (The Davison Chemical Corp., Baltimore, Md.)

At the close of the last session, C. A. Gosline of the *Manufacturing Chemists' Association*, chairman of the Technical Program Committee, summarized the results of the conference. He pointed out that the papers and discussions had served to provide a better understanding between the public, the health officers, and the manufacturers, by showing the problems which each group had to meet and by showing the steps which could be taken and were being used by the manufacturers in preventing the pollution of the atmosphere. Simultaneously with the meeting, there was an exhibit of equipment and devices for sampling atmospheric dust and for removing dust, odors, and contaminants from the air and gases leaving industrial processes.

West side of The Essex and Sussex overlooking garden and pool

Garden State Members Invite ASHVE to Spring Lake

Plans for the Semi-Annual Meeting at Spring Lake, N. J., on June 16, 17 and 18, are under the direction of General Chairman F. H. Faust, Bloomfield, and Vice Chairman H. P. Morehouse, Newark. The New Jersey section of New York Chapter will act as hosts and the arrangement committees are being organized for the many activities that are planned.

To assist members in planning for the meeting a reservation card for accommodations at The Essex and Sussex will be mailed soon. In the event that anyone desires rooms on the European plan, they will be available at several adjoining hotels within easy walking distance of the headquarters.

With its beautiful beach and excellent hotel facilities, including a charming children's dining room, The Essex and Sussex offers a wonderful opportunity for a family vacation, while attending an interesting meeting.

In the accompanying box, round-trip pullman and one-way lower berth fares from typical Chapter cities are listed. For those who plan to drive, Spring Lake is easily reached from all points of the compass on New Jersey's fine highways. From the South, it is only a short ride on the New Jersey Turnpike from the Delaware River to the junction with New Jersey highway 40 which leads to Route 35 and Spring Lake. Philadelphia drivers will find New Jersey highway 40, from Camden, the most direct route, while visitors from the West using the Pennsylvania Turnpike can avoid Philadelphia traffic by using U.S. 1 by-pass and U. S. 1 to Trenton and New Jersey highway 33 out of Trenton to N. J. 35.

From New York and New England either the New Jersey Turnpike or U. S. 1 (the Pulaski Skyway) from New York, and thence on U. S. 9 to N. J. 33, offer the best routes to Spring Lake.

The Pennsylvania and Central Railroad of New Jersey have frequent and convenient schedules from New York and Newark, and the Pennsylvania also has good service

Round-Trip Rail and One-Way Pullman Fares* From Principal Cities to Spring Lake, N.J. (via Newark)

	Rail (1st Class)	Lower	
Albany	$ 17.78	$ 1.30	(seat)
Atlanta	67.24	9.60	
Baltimore	19.44	1.74	(parlor chair)
Boston	25.42	4.05	
Buffalo	41.41	4.30	
Charlotte, N.C.	49.19	6.90	
Chicago	80.51	8.90	
Cincinnati	66.56	7.60	
Cleveland	51.61	5.80	
Columbus, Ohio	56.76	6.55	
Dallas	107.84	16.35	
Dayton, Ohio	62.71	7.60	
Denver	136.96	18.10	
Des Moines	97.46	12.25	
Detroit	61.91	6.55	
Grand Rapids, Mich.	75.01	6.55	(via Detroit)
Greensboro, N.C.	42.74	5.80	
Houston	112.59	16.60	
Indianapolis	72.16	8.90	
Kansas City, Mo.	107.31	12.80	
Los Angeles	202.49	28.90	
Memphis	89.04	12.25	
Milwaukee	$ 81.56	$ 9.95	
Minneapolis	100.51	12.25	
Montreal	37.96	4.70	
New Haven	10.10	.95	(seat)
New Orleans	102.26	13.80	
Norfolk	32.96	4.70	
Oklahoma City	108.24	15.70	
Omaha	105.61	12.80	
Pittsburgh	41.51	4.70	
Portland, Ore.	195.51	28.90	
St. Louis	93.26	10.65	
Salt Lake City	167.61	21.70	
San Antonio	121.29	19.00	
San Francisco	206.96	28.90	
Seattle	195.51	28.90	
Shreveport, La.	97.89	14.80	
Spokane	177.56	25.65	
Syracuse	30.66	3.45	
Toronto, Can.	51.41	4.70	
Tulsa, Okla.	104.89	14.80	
Washington, D.C.	22.94	2.09	(seat)
Winnipeg, Can.	125.36	17.20	

*Add 15% transportation tax.

from Philadelphia and Trenton. Air service from a number of cities is provided by All-American Airways to the Asbury Park-Long Branch Airport.

Prof. E. R. Queer, chairman of the Program and Papers Committee, has announced that three morning sessions are to be held June 16, 17 and 18 in the Ballroom of The Essex and Sussex. A variety of papers have been offered and among the subjects for discussion will be air cleaning, heat transmission studies, air distribution, and glass shading. Several papers from the Research Laboratory and cooperative colleges will be on the program.

A mailing to members in April will give further details of the Technical Session program.

DEAN SEELEY ADDRESSES OTTAWA GROUP

A group of 35 members of ASHVE met at the Chateau Laurier, Ottawa, Ont., on Tuesday, February 12, and heard Dean Lauren E. Seeley, Durham, N. H., past president of ASHVE, and dean of the College of Technology and director of the Engineering Experiment Station, University of New Hampshire, deliver a talk on *Engineering with a Human Touch.*

Dean Seeley reviewed his experiments with the effects of humidity on respiration. He pointed out that it was especially important in a climate such as Canada's to make additional provisions for adequate humidity. He stated that if you have a cold, the chances are pretty good that you are suffering from low humidity. He concluded his remarks by describing the progress in the heating and ventilating field and pointed out that the profession was performing services affecting the well being of all individuals by controlling the indoor environment.

Bernard Stotesbury acted as chairman of the meeting, assisted by W. J. Robinson and C. W. Watson, all of whom expressed their appreciation to Dean Seeley for the splendid lecture and for giving the Ottawa members an opportunity to meet one of the Society officers on home ground. The local group has indicated interest in forming a chapter of the Society.

PARTNERSHIP ANNOUNCED BY H. E. BOVAY, JR.

H. E. Bovay, Jr., Houston, Tex., announces a partnership with B. W. Burns, C. A. Lawler, J. Wayne Holland, and R. B. Robertson. The firm, with offices in the Esperson Bldg., will continue to operate under the name of H. E. Bovay, Jr., consulting engineers.

Mr. Bovay, a registered professional engineer in the states of Texas, Louisiana and Arizona, has had extensive engineering experience. He spent 10 years with The Humble Oil and Refining Co., during which time he acted as project engineer on a number of their major installations. A member of ASHVE, he is also a member of the *ASCE, Texas Society of Professional Engineers, American Concrete Institute, ASTM,* Houston Engineers Club, and many civic organizations.

Mr. Burns is a registered professional engineer in the State of Texas. He is an associate member of the *ASCE,* and a member of the *Texas Society of Professional Engineers* and the *American Concrete Institute.*

Formerly chief engineer with H. E. Bovay, Jr., Mr. Lawler is a registered professional engineer in the State of Texas. He too had experience with The Humble Oil and Refining Co., as well as with the Texas Highway Department. During World War II, he served as an officer of the U.S. Navy Civil Engineers Corps. He is a member of the *ASCE, Texas Society of Professional Engineers,* Chi Epsilon, the national honorary civil engineering fraternity, as well as civic organizations.

A member of ASHVE, Mr. Holland served as mechanical engineer with the Austin Co., and with Hudson Engineering Corp. prior to the war. During the war he was in U.S. Naval Communications Intelligence, and after his discharge he was chief engineer for Clovis Contracting Co., Inc., at Clovis, New Mexico. He joined the Bovay organization in 1947.

Mr. Robertson is a registered professional engineer in the States of Texas and California. Prior to and after the war, he was on the engineering staff of United Air Lines. During the war he was an officer in the Field Artillery, serving in the Philippines and occupied Japan. He is a member of the *Texas Society of Professional Engineers.*

INDIANA ENGINEERING COUNCIL SPONSORS MAY EXPOSITION AT PURDUE

A gathering of alumni, engineers, and several thousand college and high school students will be drawn to Purdue University Armory, West Lafayette, Ind., on the weekend of May 2, 3 and 4, 1952, to attend the Indiana Engineering Exposition, sponsored by the *Indiana Engineering Council* for the purpose of showing students and the public the opportunities in the profession of engineering.

Concurrently, Purdue University will hold an Engineering Open House in University buildings adjacent to the armory on Saturday, May 3. The highlight of the Exposition and Engineering Open House will occur on Saturday afternoon when C. F. Kettering, vice president, director, and general manager of the Research Laboratories of the General Motors Corp., will deliver an address in the Purdue Music Hall.

HARWOOD NAMED MFR'S. REPR.

Van Ness Harwood, manager of V. N. Harwood Co., Buffalo, N. Y., has been appointed manufacturer's representative for the Cleaver-Brooks Co., Milwaukee. Dealer in boiler equipment, Mr. Harwood will have a territory comprising eight counties in western New York and four counties in northwestern Pennsylvania.

Summary of Chapter Meetings*

WARM AIR HEATING HIGHLIGHTED AT WISCONSIN MEETING

The feature of the Wisconsin Chapter's February 18 meeting was a talk on warm air heating by C. W. Nessell, account executive, Minneapolis-Honeywell Regulator Co., Chicago, Ill.

Vice Pres. J. A. Lofte called the meeting to order after dinner, during which special recognition was given to Chapter member Ernest Szekely, recently elected president of the Society. The minutes of the January meeting were read and approved. Mr. Lofte explained the new proposed City of Milwaukee Code pertaining to heating, ventilating and air conditioning. It was decided to hold a special meeting so that all interested members of the Wisconsin Chapter could discuss and study the Code.

F. J. Nunlist, Jr., then introduced Mr. Nessell, the speaker of the evening, who gave an excellent address on *New Concepts of Warm Air Heating*. The first phase of Mr. Nessell's talk had to do with houses, built with a crawl space, and limited to one story construction. He described the simplest warm air heating system consisting of a furnace delivering air into the crawl space by means of three or four open end ducts.

Mr. Nessell pointed out that the warm air registers were back in the floor, rather than on inside sidewalls, that no return air collection duct system was necessary, and that the single return grill could be on a sidewall, or in the ceiling, and still afford unusually satisfactory results.

Mr. Nessell pointed out that in the average one story home, 60 to 80 percent of the entire heat loss was in the perimeter walls of the home, and that by placing long, narrow registers, particularly under windows, the admission of warm air was such that the normal downward current of cold air caused by heat loss and infiltration was nullified. This resulted in temperature gradients, from the floor to the ceiling, of 3 to 5 deg, although temperature gradients of 1 and 2 deg were not unusual in well designed systems.

Supply register velocities in the range of 100 to 300 fpm were suggested, with a velocity of 150 to 200 fpm being considered the best for good performance. Since the effects of infiltration and cold downdrafts at outside walls are eliminated, there is no cold air on the floor, and, hence, no need for a cold air return system, nor the need for floor height return grill locations.

The blower of the furnace should have a capacity so as to result in a maximum temperature rise through the furnace of 80 to 100 deg. The room thermostat controls the burner, and should be of the anticipating type so that burner operation is frequent, with short on and off periods.

Mr. Nessell warned that the use of such heating system designs should be limited to locations where the house site is well drained, and that the soil should be covered with 4 in. of gravel and then covered with heavy tar paper. The outside walls of the crawl space should be well insulated and sealed, and vents are not necessary for the crawl space.

He then went on to describe perimeter heating for houses of one story using concrete slabs. He particularly emphasized good edge insulation around the perimeter of the slab, which should be at least one to two inches thick, and in this climate should extend to 18 to 24 in. below the slab surface.

The supply runouts from the furnace to the perimeter duct in the slab should slope upward to the perimeter duct, and intersect into the perimeter duct at right angles. The perimeter duct could be of metal or glazed tile, with long, narrow, rectangular openings below the window areas for the warm air outlets.

Mr. Nessell discussed briefly, in the question and answer period, the designs used for homes, or buildings, of more than one story where perimeter heating has been used successfully. The meeting was adjourned at 9:20 p.m. with an enthusiastic rising vote of thanks for the excellent talk given by Mr. Nessell. Attendance 93. Attendance ratio 0.40.

• *BALTIMORE*—January 23, 1952. A social hour and dinner, at which the guests present were introduced, preceded the business meeting, which was called to order by Pres. W. P. Flanigan. President Flanigan announced that E. R. Kent was unable to attend the St. Louis meeting, and that F. M. Hewitt had been appointed member and G. B. Priester, alternate member, on the Chapters Conference Committee.

J. F. Malone introduced the speaker of the evening, J. F. S. Collins, Jr., secretary-treasurer, *National District Heating Association*, Pittsburgh, Pa. Mr. Collins spoke on *District Steam Distribution*, including design considerations, procedure on location, information to be included on plans and determination of the line design. Mr. Collins' talk further covered a discussion of conduit to convey steam, factors considered in the selection of conduit, tunnels in college work, use of manholes, equipment such as expansion joints and general information concerning the code handbook. A question and answer period followed the talk. Attendance 55. Attendance ratio 0.50.

Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

• *CENTRAL OHIO*—January 21, 1952. Vice Pres. A. D. Bogen presided, and called the meeting to order at 8:00 p.m. in the Grandview Inn. The minutes of the previous meeting were read and approved, and the treasurer submitted his report. A letter was read from the Cincinnati Chapter inviting Central Ohio Chapter members to attend their March 17 meeting. R. A. Wilson and R. B. Breneman reported on the television program, *Engineering Your Life*, in which the Central Ohio Chapter recently participated and which is sponsored by the *Columbus Technical Council*. H. G. Hays announced the forthcoming Indoor Comfort Conference to be sponsored by the *National Warm Air Heating and Air Conditioning Association*.

The speaker of the evening, Professor Philby, of Ohio State University, was introduced by B. E. Petry. Professor Philby called attention to the difference in the mental attitude of the graduating students of today and those of the past years. He emphasized that it is apparent that the present day graduate expects to work for what he gets and has a high regard for the value of work.

Ralph Liebert presented two films, *Air Conditioning Service Unseen* and *Elementary Electronics*, which were thoroughly enjoyed by the audience. Attendance 38. Attendance ratio 0.38.

• *CINCINNATI*—February 5, 1952. The annual joint meeting with the Cincinnati Section of *The American Society of Refrigerating Engineers* was called to order by ASHVE Chapter Pres. J. J. Bechtol. President Bechtol introduced the Chapter Officers of both societies, and *ASRE* Section Pres. Gary Schultz and Program Chairman Bert Haun made announcements regarding their coming meetings. B. R. Byard, ASHVE program chairman, announced that the program for the next meeting would be in the form of a panel discussion conducted by Chapter members. Members were asked to submit questions and subjects for discussion by the panel chosen. Pinkney Varble, chairman of the entertainment committee, announced that the 20th Anniversary Spring Dinner-Dance would be held on March 8 at the Cincinnati Club.

The meeting was adjourned to permit *ASRE* to hold a brief meeting. This was followed by an address, *Theory in Design of Cooling Towers, Coils and Air Washers*, by L. G. Seigel, associate professor of heat power engineering, Case Institute of Technology, Cleveland, Ohio. Attendance 87. Attendance ratio 0.38.

• *CONNECTICUT*—January 30, 1952. Pres. A. J. Lawless called the meeting to order at 8:30 p.m. in the Three Cups Inn, Meriden, Conn. J. M. Atherton reported for the membership committee, and announced the acceptance of the following new Chapter members: Mitchell Landon, Robert Calhoon, F. L. Vincent, and W. G. Lathrop.

The speaker of the evening was Paul P. Heinz, chief of the New Haven Fire Department, New Haven, who spoke on *Automatic Heat Detecting Type Fire Alarm Equipment in Buildings and Heating Systems*. Attendance 59.

• *DELTA*—January 11, 1952. The meeting, co-sponsored with the *American Society of Refrigerating Engineers*, was a part of the program for the three-day annual meeting of the *Louisiana Engineering Society*, held in the Beauregard Room of the St. Charles Hotel.

The presiding officers were J. E. Leininger, chairman of the New Orleans Section of the *ASRE*, and Theodore Offner, president of the ASHVE Delta Chapter. Mr. Leininger introduced the speaker, M. W. Burleson, commodities manager of insulation, Johns Manville, New York, N.Y., who discussed *Moisture Barriers and Two Temperature Insulation Materials*. Attendance 90.

• *GOLDEN GATE*—February 7, 1952. The meeting was called to order at 7:55 p.m., after which members introduced themselves and their guests. The minutes of the January 3 meeting were read and approved, and T. J. White, program chairman, announced the programs scheduled for the meetings from March through June. T. C. Douglass, Jr., membership committee chairman, urged members to follow through on membership prospects. J. E. Murray, member on the Chapters Conference Committee, gave a report on the recent Annual Meeting in St. Louis.

Vice President White introduced the first speaker of the evening, J. B. Smith, sales engineer, Johnson Service Co., San Francisco, who spoke on *Humidity Control and Instrumentation*. Mr. Smith outlined the various types of instruments in use, commenting on the ranges, accuracy and stability of each. He also described typical humidifying and dehumidifying apparatus in general use and urged careful study of their application.

The second speaker was Edward Simons, Golden Gate Chapter member and currently president of *The American Society of Refrigerating Engineers*, who spoke on *Low Temperature Humidifying and Instrumentation*. Mr. Simons described the importance of humidity conditions in the ranges of +32 deg down to —50 deg. In these ranges, spray and wick equipment form snow or rain on the cooling surface. Moisture gain and sensible heat in cold spaces, therefore, are frequently handled by dehumidification on coil surface and reheat, with or without face and bypass dampers, depending on load. He described in detail the development and operation of the hygrometer and its application to humidity control devices, usually adjustable back pressure valves. Mr. Simons demonstrated the construction and operation of the unit with slides, and a less expensive electronic humidity controller was also described and demonstrated. Attendance 86.

• *ILLINOIS*—January 14, 1952. Vice Pres. M. W. Bishop called the

meeting to order at 7:45 p.m. at the Merchants & Manufacturers Club in the Merchandise Mart. Reports were given by H. G. Gragg, membership chairman, and H. G. Chapin, treasurer. Vice President Bishop announced the appointment of W. A. Kuechenberg to the legislative committee of the *Illinois Engineering Council*. Mr. Kuechenberg reported on the activities of the *IEC* and made special mention of the testimonial dinner for Doctor Heald. Vice President Bishop, in charge of arrangements for the St. Louis Meeting, announced that a special car had been reserved for Illinois chapter members travelling to St. Louis by train.

The speaker of the evening, R. D. Tutt, chief engineer, Tuttle & Bailey, Inc., New Britain, Conn., was then introduced. Mr. Tutt spoke on *High Pressure Air Distribution*, describing the various types of high pressure systems on the market. Mr. Tutt also showed slides of the various types of sound outlet boxes with and without induction. A question and answer period followed the talk. Attendance 165. Attendance ratio 0.28.

• *INLAND EMPIRE*—January 4, 1952. Pres. L. E. Marque called the meeting to order in the Spokane Hotel, and the guests present were introduced. The minutes of the previous meeting were read and approved. J. A. Doyle presented the treasurer's report and H. A. Bickel presented the membership committee's report. The appointment of J. A. Doyle as member and P. J. Favre as alternate member on the Chapters Conference Committee was announced.

Mr. Favre introduced the speaker of the evening, A. J. Hess, president, Hess-Greiner & Polland, Los Angeles, Calif., who spoke on *Air Conditioning and Its Effect on Plant Life*. Attendance 27.

• *IOWA*—February 12, 1952. Pres. C. H. McGuiness called the meeting to order at 8:00 p.m. in the Standard Club, Des Moines. Following discussion of Chapter business and the introduction of the guests present, the meeting was adjourned for a brief intermission.

The feature of the evening, an address by J. R. Vernon, secretary and sales promotion manager, Johnson Service Co., Milwaukee, was then presented. Mr. Vernon spoke on *Automatic Temperature Control for Heating and Air Conditioning*, discussing in order the three basic elements of control systems: (1) the primary element, (2) the operator, and (3) the power source. He also discussed the classification of control instruments as to type of action, that is, two-position *vs.* proportional action, and then went on to classify thermostats and humidistats into bi-metallic strip, rigid stem, and capillary tube instruments. Mr. Vernon discussed in detail various methods of regulating sensitivity in these instruments and the need for varying sensitivity in different control situations. The talk was well illustrated with slides. Attendance 39. Attendance ratio 0.46.

• *IOWA*—January 8, 1952. The meeting was called to order by Pres. C. H. McGuiness in the Standard Club, Des Moines, and the minutes of the November and December meetings were read and approved. R. H. Schnell, program chairman, announced that the program for the year was shaping up very well, and asked for suggestions from the members. President McGuiness urged members to expend more effort in getting new members, and requested a large representation from the Iowa Chapter at the 58th Annual Meeting in St. Louis.

The speaker of the evening was J. W. May, technical director, Air Filter Division, American Air Filter Co., Louisville, Ky., who spoke on *Present Standards in the Application of Air Filters*. Mr. May opened his talk with an interesting analysis of the present day confusion in standards of rating air filters. He stated that the different types of synthetic dusts used and the various test procedures make statements of filter efficiency frequently unreliable. Mr. May went on to describe the development and application of filters, first, according to principles of operation — viscous impingement, dry or semi-dry and electrostatic; and second, according to methods of maintenance — disposable, replaceable media, washable and automatic. Attendance 43. Attendance ratio 0.56.

• *KANSAS*—January 2, 1952. Following a social hour and dinner, Pres. R. F. Bauer called the business meeting to order at 8:15 p.m. in the meeting room of Wolf's Cafeteria. Guests were introduced and the minutes of the preceding meeting were read and approved. J. W. Jenner was called on to report on the progress of the new city code. Mr. Jenner announced that he had divided the prospective code into nine sections and appointed a chairman of each section. Mr. Jenner went on to outline the problems each chairman might expect to encounter, and also gave some very constructive advice as to the solution of these problems.

O. P. Bullock, program chairman, introduced the speaker of the evening, G. C. Bergtholdt, chief engineer, The Webster Engineering Co., Tulsa, Okla., who spoke on *Gas Burners and Combustion*. Attendance 30. Attendance ratio 0.35.

• *KANSAS CITY*—February 4, 1952. The meeting was called to order by Pres. C. W. Schumacher in the Wishbone Restaurant, and the minutes of the January meeting were read and approved. W. A. Reichow, Kansas City Chapter representative on the Chapters Conference Committee, reported on the activities at the 58th Annual Meeting in St. Louis. Reports were given by the following: R. D. Hotchkiss—*membership committee;* T. I. Harriman—*refreshment committee;* H. E. Degler—*technical advisory committee;* C. D. Jones—*public relations committee;* and F. K. Ladewig—*news letter committee.*

Mr. Reichow, program chairman, introduced E. W. Cone, president of the Elmer W. Cone Co., Kansas City,

who spoke on *Interesting Sales Experiences*. Attendance 69. Attendance ratio 0.29.

• *KANSAS CITY*—January 7, 1952. Members and guests met in the Wishbone Restaurant for one of the best attended meetings the Chapter has had. The minutes of the December 3 meeting were read and approved and Pres. C. W. Schumacher read a letter from L. L. Hamig, president of the St. Louis Chapter, extending an invitation to all the members to attend the 58th Annual Meeting to be held in that city. Life Member E. K. Campbell presented a tie clasp containing the Society's emblem to Life Member W. E. Gillham in recognition of his faithful service and counsel to the Chapter, and the Society as well, since 1916.

W. A. Reichow, program chairman, introduced the speaker of the evening, S. Konzo, research professor in mechanical engineering, University of Illinois, Urbana, Ill., who spoke on *Comfort with Warm Air Heating*. Attendance 172. Attendance ratio 0.44.

• *MANITOBA*—January 17, 1952. The meeting was called to order in Salon A of the Fort Garry Hotel. President Bertram reported on the Christmas Party at the Club Copacabana held on December 7, and a vote of thanks was extended to those who helped with the arrangements.

The speaker of the evening, Cyril Burgess of the *Western Canada Fuel Association* was introduced by D. J. McIntyre. Mr. Burgess gave an interesting talk on the position coal plays in Western Canadian economy and its probable status in the future.

The following committee was appointed to take charge of arrangements for the next meeting: D. J. McIntyre, Robert Corsar, G. E. Dahlgren, and J. F. Allingham. Attendance 17.

• *MASSACHUSETTS*—January 15, 1952. Members and guests met in the Campus Room of the M.I.T. Graduate House for a social hour and dinner.

Lauren E. Seeley
Durham, N. H.

Pres. John Bonner called the meeting to order at 7:30 p.m., and in the absence of the program chairman, introduced the speaker of the evening, Lauren E. Seeley, president of the Society, and dean, College of Technology, University of New Hampshire, Durham, N. H., who spoke on the subject, *Engineering with a Human Touch*. Dean Seeley's address was very interesting, and was followed by a question and answer period. Attendance 38. Attendance ratio 0.24.

• *MEMPHIS*—January 21, 1952. Following dinner in the King Cotton Hotel, Pres. R. E. Larkin called the meeting to order and introduced and welcomed the guests. The minutes of the previous meeting were read and approved, and H. H. Wilson presented the treasurer's report.

President Larkin presented T. H. J. Burnett, Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tenn., the speaker of the evening, whose subject was *An Engineering View of the Hazards and Uses of Radioactivity*. Mr. Burnett pointed out that radioactivity is the property of instability possessed by certain kinds of atoms, and that a certain fraction of their nuclei will undergo a change called disintegration during a given time interval. Mr. Burnett stated that the safety record of the Atomic Energy Commission's national laboratories is significantly higher than any in industry. He closed his talk with the thought that radiation need not be feared, but must be respected. Attendance 27.

• *MIAMI VALLEY*—January 9, 1952. Following dinner in Neil's Restaurant, Pres. C. D. Weaver called the meeting to order, and the minutes of the previous meeting were read and approved. President Weaver announced that he would represent the Chapter on the Dayton Technical Societies' first television program, along with W. G. Wilkins and D. E. Tullis. Mr. Wilkins then presented the membership committee's report and D. E. Tullis presented a report for the spring dance committee.

D. L. Bergman introduced the speaker, G. V. Parmelee, research associate, ASHVE Research Laboratory, Cleveland, Ohio, who spoke on *The New Psychrometric Chart*. During the first part of his address, Mr. Parmelee showed slides of the Research Laboratory and discussed the projects currently underway in the Laboratory.

In discussing the new psychrometric chart, Mr. Parmelee gave the following reasons for its development: (1) to make the chart more accurate through the use of thermodynamic principles, (2) to simplify calculating, and (3) to maintain ASHVE leadership in the air conditioning field. Attendance 28.

• *MICHIGAN*—February 11, 1952. Dinner was served at 6:30 p.m. in the headquarters of the Engineering Society of Detroit. Pres. G. W. Akers formally opened the meeting, and following roll call and introduction of guests, he gave a brief report on his trip to St. Louis for the Annual Meeting.

The feature of the evening was an address by O. S. Lieberg, mechanical engineer from New York, N.Y., whose subject was *High Temperature Hot Water for Heating and Process*. Mr. Lieberg began by pointing out that this type of system has been in use in European countries since the Perkins patents in Great Britain during 1831, and there have been numerous installations in Britain, Germany, and Switzerland. The system was introduced in the United States in 1938.

Mr. Lieberg stated that, in general, such systems employ the use of water

between temperatures of 250 F to 400 F corresponding to system pressures of 15 to 200 lb per sq in. Such installations usually are applicable to projects of a large nature rather than small installations and make use of specially designed hot boilers. This particular type of boiler can be used in numbers up to four, all connected to a common steam expansion tank located above. This system uses specially designed water cooled pumps for the circulation of water. He then pointed out that water is much more stable than steam and made many interesting comparisons of the thermal storage properties of high temperature hot water as against steam. Mr. Lieberg also went on to enumerate the many other advantages of such a system as compared to steam. Attendance 125.

• *MICHIGAN*—January 14, 1952. Michigan Chapter members were guests of the Central Heating Department of the Detroit Edison Co., Detroit, for a very enjoyable evening. Activities started with a delicious dinner served to 150 members and guests of the Chapter, and 87 additional guests, who represented building managers and engineers throughout the Detroit area, in the Company's cafeteria.

Following dinner, the group retired to the Main Auditorium, and E. E. Dubry introduced the speaker of the evening, H. E. Seelye, chief engineer of the Company's Engineering Department. Mr. Seelye gave a comprehensive review of the problems confronting a utility such as the Detroit Edison Co., such as anticipating expansion requirements for a growing community, additional loads required for defense work, and the attendant problems in securing approval for building such facilities after they have been determined.

Mr. Seelye called attention to the fact that within the past 10 years, the kilowatt capacity of the company has just about doubled and if conditions continue as they have been, there may be a similar doubling of capacity within the next 10 years. He reviewed the enormous costs involved in building additional power plants and also indicated that transmission costs represent approximately two dollars for every one dollar invested in the actual power plant.

Following Mr. Seelye's address, a technicolor film was shown, which was produced by the Hurd family, owners of the Hurd Lock Co., covering an African hunting expedition.

The Chapter heartily thanked the Detroit Edison Co., for making the evening possible.

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The meeting was then turned over to J. D. Ross moderator of the panel discussion on *Hospital Heating and Ventilation*. The panel consisted of: Dr. G. T. Novinger, surgeon, Queen Elizabeth Hospital; F. J. Friedman, consulting engineer; L. C. A. Walford, consulting engineer; and R. S. Libby, contractor, the latter three Chapter members. It was generally agreed that proper regulation of temperature and humidity was among the most important problems in hospitals, in fact often a matter of life and death. Dr. Novinger stated that although it was very important to maintain proper temperatures and humidity in the operating room, it was even more important that good conditions be maintained in recovery rooms. Attendance 83.

• *NEBRASKA*—February 12, 1952. The business meeting was preceded by a social hour and dinner, held in the Hotel Castle, Omaha. Pres. K. E. Martin was the presiding officer and introduced and welcomed a new Chapter member, A. R. Dennell.

M. E. Wain, local representative of Barber-Colman Co., presented the company's new colored sound film, entitled *Engineered Air Distribution*. The film was an interesting laboratory demonstration of what can be accomplished in air distribution within a room. A discussion period followed the showing of the film. Attendance 22.

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following were appointed to the board of tellers: J. C. Fitz, *chairman*, W. A. Swain, and A. H. Moraweck, Jr. The auditing committee was appointed as follows: F. A. Fideli, *chairman*, William Caddle, and C. R. Hiers. President Graber announced that the Committee on Arrangements for the Semi-Annual Meeting would be comprised mostly of New Jersey members, and that F. H. Faust would be general chairman and H. P. Morehouse would serve as vice chairman.

The speaker of the evening was C. I. Bacheller, Development Engineering Division, General Electric Co., Bloomfield, N.J., who spoke on *Application of the Air-to-Air Heat Pump to Residential and Other Small Installations*. Mr. Bacheller reviewed the various sources of heat for the heat pump and stated that in preparing to market a heat pump as a package unit, air had been selected because of its easy availability and because it offered the lowest equipment cost requirement due to elimination of excavation cost for coils or drilling of wells.

He went on to explain how test data were obtained in various localities where the heat pumps had been installed, by means of photographic records of panel boards containing recording instruments. Those records showing readings every half hour and at every change of cycle were so voluminous that they were punched on IBM cards from which different items indicating performance could be determined.

The units which were recommended for residence installations to provide year 'round air conditioning were 3 and 5 hp, with supplemental heat in certain areas of the United States. Mr. Bacheller stated that it was felt that these two sizes would be satisfactory for the majority of well built homes in which owners wished to install heat pumps. A question and answer period followed. Attendance 100. Attendance ratio 0.20.

• *NEW YORK*—January 21, 1952. Members and guests met in the Building Trades Club for a social hour and dinner, followed by a business meeting called to order by Pres. Ernst Graber. The minutes of the November 19 meeting were read and approved, and C. S. Koehler, membership chairman, presented the names of 16 new Chapter members. President Graber appointed the following nominating committee for the election of officers for the 1952-53 season: H. J. Ryan, *chairman*, W. A. Sherbrooke, A. A. Bearman, H. S. Johnson, and C. F. Kayan.

D. J. Whealton, program chairman, introduced the speaker, Dr. L. P. Herrington, director of research, J. B. Pierce Foundation, New Haven, Conn., whose subject was *Human Efficiency and Comfort in Indoor Climates*. Dr. Herrington described the equipment used at the J. B. Pierce Laboratory of Hygiene for determining the reaction of human beings to atmospheric environment. Slides were used to show the calorimeter room and the equipment, as well as the method of obtaining test data.

The development of clothing based upon insulating value required in various cold climates was described and illustrated by slides showing how test results were used to design suitable clothing. Dr. Herrington mentioned that the thermal stress to which an individual is subjected can probably be best determined by noting the effect on the heart. He displayed charts showing the endurance limits of human beings for various conditions of temperature and humidity. Dr. Herrington also described some very recent experiments on the reaction of various sizes of animals to atmospheric conditions. Attendance 70.

• *NORTH TEXAS*—January 21, 1952. Pres. R. E. Allison called the meeting to order and recognized the following past presidents who were present: G. A. Linskie — 1949, C. R. Gardner — 1947, E. J. Stern — 1946, E. T. Gessell — 1945, M. L. Brown — 1943, and T. H. Anspacher — 1942. Members and guests introduced themselves, and the minutes of the November and December meetings were read and approved. Peter Frost, program chairman, opened a discussion on the type of programs desired for the coming year, and it was voted that the March meeting be held in Ft. Worth. A letter from *ASRE* to the ASHVE North Texas Chapter was read, inviting the Chapter to meet with them on February 11 in the Melrose Hotel to assist in countermanding the definition of the term, *air conditioning*, recently approved by the State Attorney General.

The following new committees were then introduced: *program* — Peter Frost, *chairman*, H. W. Haight, R. C. Knight, and F. L. Gray, Jr.; *attendance* — R. A. Mixon, *chairman*, W. H. Kuhn, Oslin Nation, B. E. Priest; *hospitality* — E. J. Daulong, *chairman*, S. T. Lake, Jr., W. H. Smith, Jr., and T. F. Scott, Jr.; *publicity* — H. V. Alexander, *chairman*, and M. O. Tessman, Jr.; *tech advisory* — G. H. Meffert, *chairman*, and S. I. Sirmen; and *legislature* — J. P. Ashcraft, *chairman*, and C. A. Baxter. Attendance 73.

• *NORTHEASTERN OKLAHOMA*—January 8, 1952. Members and guests met for a dinner meeting at Smith's Restaurant, after which Vice Pres. J. N. Watt called the business meeting to order. The roll was called and the minutes of the previous meeting approved as read. The election of the following officers for 1952 was announced: *president*—C. H. Dollmeyer; *vice president*—R. W. Winget; *secretary*—V. W. Miles; *treasurer*— Fred Colbert; and *board of governors*—R. F. Shoemaker, F. M. Thomas, and E. R. Cooke. Members and guests introduced themselves, and an announcement was made regarding the 58th Annual Meeting in St. Louis, January 28-30.

H. C. Hoffman, district manager, Carrier Corp., Dallas, Tex., was introduced and spoke on *Absorption Refrigeration*. Attendance 41. Attendance ratio 0.58.

• *NORTHERN OHIO*—January 15, 1952. This was the Chapter's annual

joint meeting with the Cleveland Section of *The American Society of Refrigerating Engineers*, held in the Warner Auditorium. Following dinner, Pres. John Richmond announced that the speaker for the February meeting would be J. F. S. Collins, Jr., whose subject would be *District Heating*. At the conclusion of the business meeting, the program was turned over to Sam Aub of the *ASRE*.

Mr. Aub introduced the speaker of the evening, A. B. Newton, production director, Acme Industries, Inc., Jackson, Mich. Mr. Newton spoke on *Recent Developments and Practical Aspects of the Heat Pump*, stating that the electrical utilities desired to maintain as even a load on their facilities throughout the year as possible. They are, therefore, interested in the development of the heat pump as a means of maintaining a more uniform year 'round load. He said that the work in progress is directed toward the utilization of air, well water, city water, lake water and the earth as heat sources. Mr. Newton showed slides illustrating a typical unit and typical systems for residential use. Attendance 30.

• *OKLAHOMA*—February 4, 1952. Pres. J. H. Carnahan called the meeting to order at Beverly's Drive-In. He then went on to advise that W. J. Collins, Jr., had reported on the Annual Meeting in St. Louis at the Board of Governor's meeting which preceded the regular meeting, and that details of the report would be published in the next issue of the Chapter News-Letter. President Carnahan also announced that G. T. Donceel and W. J. Collins, Jr., had been elected alternate member on the Nominating Committee and secretary of the Chapters Conference Committee, respectively, at the Annual Meeting.

Carl F. Boester, housing consultant, Purdue Research Foundation, Purdue University, W. Lafayette, Ind., was introduced by E. W. Gray as the speaker of the evening. Mr. Boester spoke on *Reflective Radiant Heating and Cooling*, and began his address by discussing the theory of reflective radiant heating and cooling as set forth by Dr. Clarence Mills of the University of Cincinnati. Mr. Boester stated that Dr. Mill's theory deals with the minimum requirements to maintain comfort, accomplishing heat transfer by radiation alone, independent of heat loss or gain. Dr. Mills had constructed a home in Cincinnati, where he had experience with this type of heating and cooling, and in spite of severe physical limitations he has been able to maintain comfort or *thermal equilibrium*. Mr. Boester stated that this particular type of heating system requires surface materials used in the building to have a high reflectivity and a low emissivity.

He went on to state that when such systems are developed to the point of practical usage, the energy requirements will be such that electrical energy can be economically used and that the less than standard heat loss factors used will permit fundamental changes in construction design. He pointed out that in this type of system the energy consumption is necessary only when the building is occupied.

Mr. Boester also gave a brief review of the use of high temperature hot water heating systems, setting out their particular advantages. He described briefly a human waste disposal unit which he said would cut water consumption in residences as much as 75 percent. Attendance 74. Attendance ratio 0.54.

• *OKLAHOMA*—January 14, 1952. The meeting was called to order by Pres. J. H. Carnahan at 8:00 p.m. in Beverly's Drive-In. President Carnahan advised that an invitation had been received from the St. Louis Chapter to attend the 58th Annual Meeting, January 28-30. He also reminded the members that the February meeting date was February 4 and that C. F. Boester, housing consultant, Purdue Research Foundation, Purdue University, Lafayette, Ind., would be the speaker.

The speaker of the evening was G. F. Landgraf, vice president in charge of engineering, Trion, Inc., McKees Rocks, Pa., who spoke on *Electrostatic Precipitation*. Mr. Landgraf began with a discussion on Dr. F. G. Cottrell's development of electrostatic precipitation for use in clearance of industrial air pollution. He stated that this type of electrostatic precipitation was not suitable for air conditioning or ventilation purposes because of the prohibitive amount of ozone generated. Dr. G. W. Penney discovered that by using positive instead of negative charges as used in the Cottrell method and by using plates instead of wires with a single charge, the amount of ozone produced was reduced very materially, permitting the use of electrostatic precipitation in ventilating and air conditioning systems. The same principle as that developed by Dr. Cottrell was used; however, lower voltages were permissible and desirable. Mr. Landgraf stated that electrostatic precipitation equipment can be developed readily for the removal of 99 percent of air borne bacteria and that 90 percent removal is suitable for air conditioning systems. He then went on to enumerate a number of examples of industrial uses of electrostatic precipitation. Attendance 49.

• *ONTARIO*—February 6, 1952. Pres. William Philip called the meeting to order in the Royal York Hotel and extended a welcome to all guests. J. H. Fox, Council member, reported on the Annual Meeting in St. Louis, announcing that a new Chapter had been chartered in Vancouver, which will be called the British Columbia Chapter. President Philip introduced Dean Tupper of the University of Toronto, who spoke briefly on the much publicized report that there is a dire shortage of graduating engineers from Canada's universities. Dean Tupper stated that the shortage was not as critical as was reported and that in his opinion there would not be more than 1000 unfilled engineering positions in Canada due to the smaller graduating classes.

The speaker of the evening was H. G. Conn, head of the Department

of Mechanical Engineering, Queens University, Kingston, Ontario. Professor Conn spoke on *Heating of Small Homes*, and used slides to illustrate. Attendance 167. Attendance ratio 0.61.

• *ONTARIO*—January 15, 1952. Pres. William Philip called the meeting to order in the Royal York Hotel, and introduced the student members from the University of Toronto, who were the Chapter's guests for the evening. N. W. Kingsland, chairman of the *On to St. Louis* committee, announced the final arrangements for transportation to the 58th Annual Meeting.

The meeting was then turned over to a panel discussion on the subject, *Different Types of Heating*, with J. H. Ross acting as chairman. The speakers and their subjects were J. F. O'Neill — *Non-Ferrous Convectors;* W. A. Connor — *Radiant Panel Heating;* G. C. Toms — *Cast Iron Convectors;* J. L. Hemphill — *Baseboard Heating*. Attendance 122. Attendance ratio 0.48.

• *OREGON*—January 3, 1952. Pres. H. W. McKenzie called the meeting to order and introduced the guests, who included E. H. Langdon and R. E. Chase, Sr., Pacific Northwest Chapter members, A. J. Hess of the Southern California Chapter and chairman of the Chapters Conference Committee, and Fritz Honerkamp of the New York Chapter.

Following a brief intermission, the meeting was re-opened and K. H. Hanson introduced the speaker, J. A. Freeman, Oregon Chapter past president and partner-engineer, Western Engineering Co., Portland, Ore. Mr. Freeman spoke on *Refrigeration and Cooling as Applied to Air Conditioning*, pointing out that well water in the Oregon area is usually not cold enough to produce the required leaving air temperature in an air conditioning system. Refrigeration then becomes a necessity if proper conditions are to be maintained. Mr. Freeman gave two examples to substantiate his point, listing the various heat gains in each of two typical buildings and then solving the problems to show required water temperatures.

The minutes of the previous meeting were read, and W. R. Pindell presented the treasurer's report. K. R. Murhard reported on the progress of the 1952 Air Conditioning Conference, and announced that the dates are set for April 10, 11 and 12. President McKenzie called on Mr. Hess, who spoke briefly on Society matters all of which were of interest to the members. Attendance 54. Attendance ratio 0.32.

• *PHILADELPHIA*—February 14, 1952. Following dinner in the Engineers Club, Pres. E. K. Wagner called the meeting to order at 8:50 p.m. The report of the nominating committee, submitting nominees for officers for 1952-53, was presented and all other Chapter business was postponed in view of the program planned.

The speaker of the evening was J. W. James, vice president in charge of research, McDonnell & Miller, Inc., Chicago, who gave a very interesting address on *Operation Characteristics of Hot Water Heating Systems*, using slides to illustrate his presentation.

The feature of the evening was the presentation of the F. Paul Anderson Medal for 1951 to Dr. Homer Addams, Charter member and past president of the Society, by Dean L. E. Seeley, Society president for 1951. President Wagner said that Philadelphia Chapter was greatly pleased that one of its members was specially honored and that the ceremony was carried out in Philadelphia. He introduced Merrill Blankin, Society past president, who recalled how many important Society activities had been sponsored by Philadelphia members. He paid tribute to the late Thornton Lewis, donor of the F. Paul Anderson Award, and other Philadelphians who had contributed to the establishment of such Society activities as the Research Laboratory and THE GUIDE.

Dr. Homer Addams

A message from H. P. Gant, a past president and Life Member of the Society, was read, and A. V. Hutchinson, executive secretary of the Society, briefly reviewed the history of the F. Paul Anderson Medal. Among the attendance of 160 were members of Dr. Addams' family and many of his business associates.

• *PITTSBURGH*—February 18, 1952. The meeting was called to order in Webster Hall at 8:00 p.m., following dinner and a brief recess. Pres. W. D. Simpson was the presiding officer and the minutes of the previous meeting were read and approved. B. B. Reilly reported on the Annual Meeting in St. Louis and on the Chapters Conference Committee meeting which he attended as the Chapter's representative on the committee. Mr. Reilly, who is also the Chapter's program chairman, then announced that R. S. Dill would speak on *Research in Domestic Heating* at the March 17 meeting. L. S. Maehling of the membership committee and C. L. Benn, treasurer, announced that they would make reports in March.

The speaker of the evening, H. E. Zankey, Pittsburgh Lectrodryer Corp., was then introduced. Mr. Zankey substituted for G. L. Simpson, who was unable to attend, and spoke on the same subject that Mr. Simpson had selected, *Ocean of Air*. He showed slides to illustrate his talk, and these showed the various cloud formations. He described the atmospheric conditions affecting flying, and traced the history of flying from the year 1800, when balloons were sent up to determine the

degrees of temperature, down to the present day method of using rockets to determine the weather conditions. The meeting adjourned at 9:30 p.m. Attendance 35.

• *PITTSBURGH*—January 21, 1952. Dinner was served at 6:45 p.m. in Webster Hall to 84 members and guests. The business meeting was called to order by Pres. W. D. Simpson, and the minutes of the December meeting were read and approved. B. B. Reilly, program chairman, reported that G. L. Simpson, vice president and general manager, Pittsburgh Lectrodryer Corp., Pittsburgh, Pa., would speak on *Ocean of Air* at the Chapter's February 18th meeting. Reports were then given by L. S. Maehling for the membership committee and O. L. Williams reported for the roster committee.

The speaker of the evening, O. S. Lieberg, mechanical engineer from New York, N. Y., spoke on *High Temperature Water Systems,* tracing the development of high pressure hot water heating back to 1831, to a man named Perkins. In 1835, however, this system was changed to high temperature water heating. Mr. Lieberg spoke in general of the high temperature heating system and showed slides of the boiler, drum (tank), pumps, valves, and a layout of piping. In between showing these slides, he described the process of laying out the system with all the factors of heat transmission, and stated that there were three types of heat stations, low pressure, high temperature, and the thermal electric station, and then went on to describe the application of each system. He pointed out the details of design and the problems one would encounter in an improperly designed system.

After a formal discussion period many of the members and guests remained for an informal question and answer period long after the meeting was adjourned at 10:30 p.m. Attendance 115.

• *ROCKY MOUNTAIN*—January 9, 1952. Pres. B. H. Spurlock, Jr., called the meeting to order at 8:00 p.m. in the Albany Hotel, and the guests present were introduced. The treasurer made a brief report, and President Spurlock spoke briefly on the Chapter's invitation to have the 1953 Semi-Annual Meeting in Colorado.

The speaker of the evening was E. A. Froese, branch manager, York Corp., Denver, Colo., whose subject was *Centrifugal Refrigeration Compressors.* Mr. Froese discussed some of the new principles used in the development of the latest centrifugal machines, and he also showed a sound film on the basic principles and operation of these units. Prior to his address, Mr. Froese conducted a tour through a new local department store, in which 350 tons of centrifugal refrigeration had been installed. Attendance 85.

• *ST. LOUIS*—January 8, 1952. The meeting was called to order by Pres. L. L. Hamig in Town Hall, and the minutes of the previous meeting were read and approved. G. H. Bemarkt submitted his treasurer's report and J. B. Killebrew submitted the membership committee's report. C. H. Burnap announced that the Chapter would be the guests of the Kennard Corp. for the next meeting, to be held February 12 at the Kennard Plant. B. L. Evans, general chairman of the Committee on Arrangements for the Annual Meeting, reported on the progress of the plans, followed by reports by various committee chairmen.

Mr. Burnap introduced the speaker of the evening, Cyril Tasker, director of research, ASHVE Research Laboratory, Cleveland, Ohio, who was substituting for H. B. Nottage, research associate at the Laboratory, who was ill. Mr. Tasker gave the history of the Laboratory, tracing its growth and enumerating its many contributions to industry. He gave a very interesting presentation on the methods employed for testing heat flow from panels, using slides to illustrate. Mr. Tasker pointed out that every effort was being made to obtain accurate data for use by industry and that the thoroughness of the tests on panel heating and cooling were typical of the Laboratory's work. A question and answer period followed the talk. Attendance 63.

• *SHREVEPORT*—January 17, 1952. The meeting was held in the Colonial Room of the Caddo Hotel, with Pres. R. M. Hood presiding. The minutes of the December meeting were read and approved with one slight correction, and M. A. Hudson presented the treasurer's report for 1951. President Hood announced preliminary plans for the Southwestern Air Conditioning and Heating Conference to be held at College Station, Tex., sometime in April; and he also urged members to attend the Society's 58th Annual Meeting in St. Louis.

Vice Pres. W. S. Evans introduced J. S. Malahy, partner in the firm, Hadra & Malahy, consulting engineers, Shreveport, who was the speaker of the evening. Mr. Malahy gave a very interesting talk on *Principles of Heat Load Calculations,* followed by a question and answer period. Attendance 30. Attendance ratio 0.81.

• *SOUTH TEXAS*—February 15, 1952. A social hour and dinner preceded the business meeting, which was called to order by Pres. R. J. Salinger at 7:30 p.m. Chapter members Philip Kalman, of Rodgers-Barbeck Co., and H. D. Grant, of F. J. Evans Engineering Co., gave brief biographical sketches. The minutes of the previous meeting were read and approved, and C. L. Fleming announced that E. R. Michalle of the Worthington Pump and Machinery Co. would be the guest speaker at the March meeting.

Mr. Fleming introduced the speaker of the evening, Dr. R. C. Jordan, head, Department of Mechanical Engineering, University of Minnesota, Minneapolis, Minn. Dr. Jordan, in speaking on *Heat Sources and Heat Pump,* covered the history of the heat pump, the various types of domestic, commercial and industrial uses of pumps today, and the potentialities of the heat pump in

the various sections of the country. Dr. Jordan used slides to illustrate. Attendance 69. Attendance ratio 0.31.

• *SOUTH TEXAS*—January 18, 1952. Following a social hour and dinner at the Alabama Catering Service, the meeting was called to order by Vice President C. L. Fleming, who introduced J. N. Letsos, Jr., of Airtex, Inc., and M. E. Linn, of F. J. Evans Engineering Co., Houston, both of whom gave brief biographical sketches. The treasurer's report was then submitted and approved. Vice President Fleming read the formal invitation from the St. Louis Chapter to attend the 58th Annual Meeting, and D. M. Mills reported on the status of the invitation extended to the Society to hold the 1954 Annual Meeting in Houston. Mr. Mills pointed out that a large attendance at St. Louis would demonstrate the Chapter's eagerness to have an Annual Meeting in Houston. It was announced that Dr. R. C. Jordan, head, Department of Mechanical Engineering, University of Minnesota, Minneapolis, Minn., would speak on *Sources of Heat for the Heat Pump* at the February meeting.

The speaker of the evening was J. M. Hartman, in charge of the Research Laboratory for Kewanee Boiler Co., Kewanee, Ill., who traced the history and development of both steam and hot water boilers from the early stage up to the present and explained how various boilers are rated. Attendance 116. Attendance ratio 0.28.

• *SOUTHERN CALIFORNIA*—January 7, 1952. Members and guests met in the Carolina Pines Restaurant, and following dinner, the meeting was called to order by Pres. M. C. Greiner. A film showing explosive hazards of superheated water under standard city water pressures was shown by Ralph Numert as an extra added feature.

V. J. Burke, program chairman, introduced the speakers of the evening, Maron Kennedy, William L. Holladay, and G. D. Lord, all Chapter members, speaking on the subject *Dehumidification Methods*. Mr. Kennedy outlined the uses of sprayed coil dehumidifiers and the history of their development in the Los Angeles area. He went on to tell of the development of D.X. coils and capillary air washers, enumerating their advantages and disadvantages.

Mr. Holladay outlined the development of the package air conditioning unit, also explaining its advantages and disadvantages.

Mr. Lord explained the use of dessicants in dehumidification, giving special mention to silica gel and lithium chloride solutions. Attendance 74. Attendance ratio 0.26.

• *WASHINGTON, D. C.*—January 9, 1952. The annual joint meeting with the Baltimore Section of *The American Society of Refrigerating Engineers* was held in the Grace Dodge Hotel. The business meeting was called to order in the Hotel's Garden House, following the dinner, which was served to 147 members and guests of both societies. ASHVE Chapter President, S. R. Allen, presided and welcomed the guests.

G. C. F. Asker, chairman of the meetings committee, introduced the speaker of the evening, C. S. Leopold, consulting engineer, Philadelphia, Pa. Mr. Leopold spoke on *Panel Cooling*, using slides to illustrate recent installations and equipment. A question and answer period was conducted at the conclusion of the talk. Attendance 157. Attendance ratio 0.71.

• *WESTERN MICHIGAN*—February 11, 1952. Dinner was served to members and guests at 6:30 p.m. in the dining room of the Y.W.C.A., Kalamazoo, followed by the opening of the business meeting by Pres. W. C. DeRoo. The minutes of the previous meeting were read and approved, and the treasurer's report was submitted. Vice Pres. H. R. Limbacher gave a brief report on his attendance at the Annual Meeting in St. Louis.

R. B. Engdahl, supervisor, Battelle Memorial Institute, Columbus, Ohio, the speaker of the evening, was introduced by Vice President Limbacher. Mr. Engdahl spoke on *Chimneys—Principles of Operation and Their Practical Application*, using two miniature chimneys to demonstrate the performance of a cold and warm chimney by use of a chemical smoke and candles for the fire. The two chimneys responded in approximately the same way as long as there was a fire below. However, as soon as the fire was taken away, a reverse action or downdraft would occur on the cold chimney. Among the other points discussed by Mr. Engdahl were the control of air into the home, and chimneys that are too large, too small, or too short. Attendance 74. Attendance ratio 0.34.

• *WESTERN MICHIGAN*—January 14, 1952. The meeting was called to order by Pres. W. C. DeRoo at The Poplars in East Lansing, following dinner, which was served at 6:45 p.m. The minutes of the previous meeting and the treasurer's report were read and approved, and Vice Pres. H. R. Limbacher reported on plans for the February meeting, to be held in Kalamazoo. S. M. Paganelli, local Chapter member, gave a brief talk on *Flue Gas Analysis*, the first of a series of short talks to be given by Chapter members at each meeting.

The speakers of the evening were Robert McClintock and K. E. Robinson, chapter member, both from the Bureau of Industrial Health of the Michigan Department of Health. The subject of their presentation was *A Visual Demonstration of Industrial Ventilation*, and a miniature blower and duct system was used to demonstrate the resistance in a square elbow as compared to a round, and the collection of smoke or vapor with different types of hoods. Messrs. McClintock and Robinson made it obvious that hood design is one of the major factors in the design of a good exhaust system using the least amount of air.

Attendance 87. Attendance ratio 0.42.

• *WESTERN NEW YORK*—February 11, 1952. The meeting was called to order by Pres. T. F. Killeen in the University Club, and the minutes of the January meeting were read and approved. N. J. Forrester made a report on the Technical Society Conference; and President Killeen announced that a film on the construction of the United Nations building in New York City would be shown at the March meeting through the courtesy of the National Tube Co. Joseph Davis pointed out several interesting details of the building, which he had inspected. President Killeen gave a brief report on his attendance at the Annual Meeting in St. Louis.

Messrs. Reil, Meyer, Carrol, and MacKenzie of the Crane Co., who were the hosts of the Chapter members for dinner, were introduced. A film, *Piping Pointers* was shown, and Mr. Reil made some explanatory remarks. Attendance 57.

• *WESTERN NEW YORK*—January 14, 1952. The meeting was called to order by Pres. T. F. Killeen at 8:00 p.m. in the University Club, and the minutes of the December meeting were read and approved. President Killeen announced that it had been tentatively agreed that the Chapter will collaborate with *ASRE* on the proposed panel for the Technical Society Conference. Members to serve on the panel, he stated, would be notified and full details furnished at the February meeting. R. E. Lang read the notice from the *Institute of Boiler and Radiator Manufacturers*, regarding the three-day course to be given in Buffalo, February 13-15.

J. J. Landers presented L. A. Cherry with his Life Membership certificate in the Society, and Mr. Cherry responded with a very brief but humorous resume' of why he has succeeded as a consulting engineer.

President Killeen then introduced the speaker of the evening, Clarence Glazer of the Junior Chamber of Commerce. Mr. Glazer presented two films on atomic bombing, and then went on to explain the pressing need for civil defense volunteers in the Buffalo area. Attendance 29.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references, the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month, there have been 99 applications for membership, including 5 student applications and 5 reinstatements; in addition 5 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by April 30, 1952, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. ΔAdvancement.

Arkansas

†ELGIN, R. D., Owner, Peerless Sales, Little Rock. REFERENCES: R. E. Blaylock, J. W. Kice, E. N. Pettit, H. R. Rees.

SWINDLER, C. P., Construction and Service Mgr., General Air Conditioning Corp., Little Rock. REFERENCES: H. C. Hoffman, C. J. Kummer, L. G. Powers, H. E. Rex.

WELLONS, J. A., Pres., General Air Conditioning Corp., Little Rock. REFERENCES: R. E. Blaylock, Maury Hughes, Jr., J. C. Lewis*, Jim Mullens*.

California

ANDERSON, B. D., Design Engr., C. F. Braun & Co., Alhambra. REFERENCES: R. E. Arneson, H. E. Maguire, F. M. Patterson, D. M. Sackett.

BRESSOUD, C. J., Engr., Ilg Electric Ventilating Co., Los Angeles. REFERENCES: H. E. Maguire, C. E. Parks, F. M. Patterson, H. J. Swanson*.

FARWELL, W. G., Engr., Cory & Joslin Inc., San Francisco. REFERENCES: E. C. Cooley, Jr., J. F. McIndoe, G. M. Simonson, T. J. White.

GENDLER, G. L., Cons. Engr., Berkeley. REFERENCES: K. F. Baldwin, Jr., F. K. Crouch, T. J. Janes, K. C. Mirov.

JORDAN, H. S., Estimator, Neil H. Peterson Co., San Francisco. REFERENCES: H. V. Hickman, N. H. Peterson, Norman Sharpe, J. H. Van Dyke.

LOWE, W. E., Application Engr., Westinghouse Electric Corp., Orinda. REFERENCES: C. E. Atkins, G. K. Brokaw, James Gayner, J. E. Murray.

WOO, ROBERT, Htg. & Vtg. Designer, C. F. Braun & Co., Alhambra. REFERENCES: R. E. Arneson, H. E. Maguire, F. M. Patterson, D. M. Sackett.

Colorado

BLUSH, F. L., Pres., Frank L. Blush & Son Htg. Co., Inc., Denver. REFERENCES: N. H. Brickham, J. J. Johnson, H. W. Marshall, E. J. McEahern.

Connecticut

BARTOL, J. H., Vice Pres., W. B. Connor Engrg. Co., Danbury. REFERENCES:

H. A. Baker, Amos Turk, T. H. Urdahl, W. M. Wallace, II.

GOODRICH, W. H., Engr., Northern Heating Supplies, Inc., West Hartford. REFERENCES: J. R. Howard, W. G. Lathrop, R. M. Ripley, C. E. Weisner.

†PHILLIPS, L. R., Head of Research Dept., Anemostat Corp. of America, Hartford. REFERENCES: Fritz Honerkamp, W. O. Huebner, E. J. McArdle, V. F. Self.

TUCKER, R. P., Vice Pres. & Treas., The Tucker Co., Hartford. REFERENCES: J. M. Atherton, R. C. Atherton, G. F. Murray, A. L. Wasserman.

Delaware

ΔROBINSON, G. L., Htg. & Vtg. Engr., E. I. du Pont de Nemours & Co., Wilmington. REFERENCES: L. C. Davidson, M. G. Kershaw, Ludwig Mack, A. S. Robinson.

District of Columbia

RINNE, O. M., Mech. Engr., Veterans Administration Technical Service, Washington. REFERENCES: H. G. Carleton, L. W. Carter, L. L. Delong, J. S. King.

Georgia

AMMONS, H. A., Engr., Ketterson, Lazenby & Borum, Atlanta. REFERENCES: J. W. Borum, F. W. Bull, R. B. Kitch, J. M. Lazenby.

THOMPSON, J. C., Htg. Sales Engr., Georgia Power Co., Atlanta. REFERENCES: L. L. Barnes, J. F. S. Collins, Jr., S. N. Roberts, V. J. Suche.

Illinois

ΔBARNES, C. M., Dir., Air Conditioning School, Industrial Training Institute, Chicago. REFERENCES: C. M. Burnam, Jr., J. H. Clarke, P. J. Marschall, G. V. Zintel.

COOPER, R. E., Sales' Mgr., Air Filter Div., Wilson & Co., Inc., Chicago. REFERENCES: M. Bronstein*, B. F. McLouth, Lloyd Qualley*, William Wake*.

GRAMIN, WILLIAM, Buyer, Htg. Dept., Montgomery-Ward, Chicago. REFERENCES: A. N. Nelson, W. R. Teller, A. L. Walters, F. J. Wilkinson.

KORFF, H. H., Construction Supt., Johnson Service Co., Chicago. REFERENCES: A. M. Bladen, J. J. Phillipi, J. R. Vernon, O. G. Ward.

LUFT, F. W., Jr., Mgr., Htg. Sales, Raymond Fisher Supply Co., Chicago. REFERENCES: G. W. Bornquist, W. M. Brayton, R. T. Flickinger, J. S. Kearney.

Indiana

NIEWOEHNER, R. L., Vice Pres., Niewoehner-Nicklas Inc., Richmond. REFERENCES: S. E. Fenstermaker, W. H. Gaskill, Jr., George Heidenreich, J. M. Rotz.

YOUNG, R. T., Air Cond. Reg'l. Repr., Servel, Inc., Evansville. REFERENCES: S. W. Beaty, Theodore Offner, Sr., A. H. Scott, J. M. Townsend.

Maine

PATRY, H. L., Mgr., Reliable Air Conditioning Co., Lewiston. REFERENCES: C. J. Low, L. G. Miller, C. H. Pesterfield, K. E. Robinson.

Maryland

HIGDON, C. R., JR., Engr., Minneapolis-Honeywell Regulator Co., Baltimore. REFERENCES: E. S. Berngartt, Edwin Bock, E. R. Kent, J. K. Wolford.

NEWCOMB, E. O., Jr. Engr., Morris Engineering Co., Baltimore. REFERENCES: W. P. Flanigan, H. D. Glaser, R. L. Hughes, E. J. Morris.

NILES, M. A., Engr., James K. Wolford, Baltimore. REFERENCES: F. M. Hewitt, R. T. Hughes, James Posey, J. K. Wolford.

Massachusetts

FORBES, R. R., Partner, R. T. Forbes Co., Boston. REFERENCES: J. A. Cameron, B. S. Malin, E. M. Pierce, G. B. Torrens.

JONES, H. S., Engr., C. R. Swaney Co., Boston. REFERENCES: D. W. Blair, F. H. Brigham, C. T. Flint, C. W. Larson.

Michigan

BLACK, T. J., Cons. Engr., Detroit. REFERENCES: J. L. Best, D. S. Falk, L. F. Major, Albert Petronis.

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GREEN, L. N., JR., Sales Mgr., Heating Equipment Co., Detroit. REFERENCES: A. L. Ciesliga, L. R. Johnson, R. H. McGeorge, W. L. Swadling.

HUNTER, M. C., JR., Mech. Engr., C. L. Toonder & Assocs., Detroit. REFERENCES: C. F. Mally, R. H. Stevens, R. E. Strand, C. L. Toonder.

LABBANCZ, J. F., Estimator, R. L. Spitzley Heating Co., Detroit. REFERENCES: J. G. Black, Jr., J. Bleckie*, P. F. McNally*, J. H. Spitzley.

LINTON, J. C., Mech. Engr., C. L. Toonder & Assocs. Detroit. REFERENCES: Lawrence Cauldwell*, R. H. Stevens, R. E. Strand, C. L. Toonder.

McDONALD, R. M., Jr. Designing Engr., Snyder & McLean Engrs., Detroit. REFERENCES: Dermid McLean, Garni Moretti, J. A. Park, J. W. Snyder.

STEVENS, W. H., Pres., Stevens Htg. & Vent. Co., Detroit. REFERENCES: G. W. Akers, Marshall Bruce, Earl Burke*, R. L. Deppmann.

TROSKE, G. J., Mech. Draftsman, Austin Engineers, Inc., Midland. REFERENCES: P. A. Fanner*, Richard Malott*, R. C. Soronen, Fred Southworth*.

TURNER, PETER, Htg., Vent. & Air Cond. Engr., George Wagschal Assocs., Detroit. REFERENCES: W. A. Brown, L. A. Burch, H. M. Keyser, W. P. Ziemba.

Missouri

KENNARD, S. M., III, Pres., Kennard Corp., St. Louis. REFERENCES: C. H. Burnap, J. B. Killebrew, J. S. Rosebrough, S. M. Zivi.

PERKINS, R. M., Designer, Howarth, Scott & Kinney, Kansas City. REFERENCES: W. E. Howarth, R. F. Johnson, O. W. Kinney, A. R. Scott.

SCHUETTENBERG, C. H., Owner, C. H. Schuettenberg Co., St. Louis. REFERENCES: G. H. Bemarkt, W. C. Kaber, W. A. Klein, H. T. Kucera.

SCHULTE, F. W., Jr., Mfrs. Rep., St. Louis. REFERENCES: N. B. Barsha, R. C. Denkmann*, H. R. Odell*, R. O. Reeves.

WAITES, R. R., Product Application Engr., Herman Nelson Div., American Air Filter Co., Inc., St. Louis. REFERENCES: C. H. Burnap, Don Fischer, J. D. Rosebrough, John Shank.

Nebraska

†BREHM, H. P., Engr., H. S. Seymour, Omaha. REFERENCES: E. H. Davis*, K. E. Martin, E. G. Schaumberg*, H. S. Seymour*.

New Hampshire

JACOBS, A. J., Designer, Anderson-Nichols & Co., Concord. REFERENCES: G. D. Beals*, C. F. Boulter*, L. C. Mandell, M. G. Rolland*.

New Jersey

IWASHITA, G. K., Mgr., Product Planning, General Electric Co., Bloomfield. REFERENCES: Lester T. Avery, F. H. Faust, R. C. Jordan, C. F. Kayan.

New York

BORMANN, R. H., Engr., Minneapolis-Honeywell Regulator Co., New York. REFERENCES: J. J. Costa*, Ernst Graber, J. J. Gribbin*, C. S. Koehler.

DAVIS, R. L., Secy.-Treas., Perlite Institute, New York. REFERENCES: C. B. Bradley*, H. E. Lewis, E. R. Queer, K. M. Ritchie*.

EDWARDS, H. D., Works Engr., Linde Air Products Co., New York. REFERENCES:

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The return mail is a loss to you, and an added expense to the Society.

In your own interest, will you please advise us at once of any change in your business or home address, indicating which is your mailing address.

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H. A. Baker, A. C. Buensod, B. H. Jennings, L. L. Lewis.

KLARER, H. O., Application Engr., Carrier International, New York. REFERENCES: J. N. Clemmer*, S. T. Hegerman*, W. R. Schmitz*, Americo Silvera.

KLEIN, W. P., Engr., Taco Heaters Inc., New York. REFERENCES: A. L. Behrens, Saul Horwitz, J. R. Murphy, W. J. Sliney.

LA TART, L. J., Research Associate, Revere Copper and Brass, Inc., Rome. REFERENCES: F. W. Hutchinson, W. L. Lynch, D. L. Mills, P. D. Robson.

SCHWARTZ, ALEXANDER, Pres., Infra Insulation, Inc., New York. REFERENCES: A. A. Bearman, W. L. Fleisher, H. G. Junger, W. J. Osborn.

North Carolina

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OBITUARIES

N. B. FENTON
Jackson, Mich.

Word has been received of the death of Nelson B. Fenton on December 29, 1951. Mr. Fenton went into semi-retirement about a year ago because of a heart ailment, which finally claimed his life.

Active in sheet metal industries in Jackson for many years, he was owner of the Steinke-Fenton Sheet Metal Works at the time of his death. Prior to entering business for himself, he worked for the Smith-Winchester Co., sheet metal works.

Mr. Fenton was an avid outdoorman, and was prominent in activities of the Jackson County Conservation League for over 20 years. At various times he served as a director and officer of the League and was chairman of the League's game predatory committee.

Recognized as one of the best trap shooters in the midwest, Mr. Fenton was largely responsible for rehabilitation of the Conservation League Clubhouse and for the sponsorship of two state trap shoots. He was also active in the League's pheasant campaign.

Mr. Fenton had a wide circle of friends among the Western Michigan Chapter members, as well as in the heating and ventilating profession, and his presence will be missed at the various chapter functions.

He is survived by his widow, Mrs. Margaret Fenton, to whom the Officers and Council extend their sincere sympathy.

S. A. S. PATORNO
New York, N. Y.

The Society announces with regret the death of Sullivan A. S. Patorno, consulting engineer from New York, on Sunday, February 10, 1952.

A native New Yorker, Mr. Patorno attended Stuyvesant High School, College of the City of New York, and took a mechanical engineering course at Cooper Union. His first experience was with Konrad Meier as heating and ventilating draftsman and designer. After four years with Henry C. Meyer, Jr., as heating and ventilating engineer for the design of heating and ventilating systems, he received an assignment with the Ordnance Department at the Picatinny Arsenal, N.J., where he was in charge of the design and construction of heating and ventilating systems for a new group of buildings. Following World War I he returned to Henry C. Meyer, Jr., which later became the firm of Meyer, Strong & Jones, Inc., New York.

During the earlier part of his career, Mr. Patorno was responsible for the installation of heating and ventilating systems in the following buildings: Central Branch, Y.M.C.A., Brooklyn; Federal Reserve Bank, The Roosevelt Hotel, Guaranty Trust Building, and the Cunard Building, all in New York; the Masonic Hospital (Soldiers Memorial), Utica, N. Y.; Hotel Syracuse, Syracuse, N. Y.; Founder's Building at Loomis Institute, Windsor, Conn.; the Stillman Theater and Wade Park Manor (Apartment Hotel), Cleveland, Ohio.

In 1935, Mr. Patorno left Meyer, Strong & Jones to start his own consulting engineering practice, which he continued to the time of his death. Among the many projects and buildings for which Mr. Patorno designed mechanical equipment as a consulting engineer are: the first completely air conditioned apartment house at 25 East 83rd St., New York City; Trinity Library for Trinity College in Hartford, Conn.; air conditioning equipment and systems for the International Business Machines Electronic Calculator and its Public Showroom at 57th St. & Madison Ave., New York City.

Mr. Patorno had a great deal of experience with large housing developments, both private and public, among them being the Marshall Field Garden Apartments, Palmer Square in Princeton, N.J., and many low rent projects in New York City, such as the Lillian Wald Houses, Nostrand Houses, Dyckman Houses, and the Bronx River Houses. He had also been retained by the New York City Housing Authority as a consultant for several projects designed by other engineering firms.

Mr. Patorno is survived by four brothers and two sisters, to whom the Officers and Council of the Society extend their sincere sympathy.

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● **BALTIMORE:** Organized 1949. Headquarters, Baltimore, Md. Meets, Third Wednesday. PRESIDENT, W. P. Flanigan, 5508 Greenleaf Rd., Baltimore 10. SECRETARY, F. M. Hewitt, 11 E. 21st St., Baltimore 18.

● **CENTRAL NEW YORK:** Organized 1944. Headquarters, Syracuse, N. Y. PRESIDENT, J. H. Carpenter, 3515 Midland Ave., Syracuse. SECRETARY, H. K. Ormsby, 205 S. Townsend St., Syracuse 2.

● **CENTRAL OHIO:** Organized 1944. Headquarters, Columbus, Ohio. Meets, Third Monday. PRESIDENT, R. S. Curl, 590 Oak St., Columbus. SECRETARY, N. T. Hess, 63 E. Goodale St., Columbus.

● **CINCINNATI:** Organized 1932. Headquarters, Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, J. J. Bechtol, P.O. Box 1667, Cincinnati 1. SECRETARY, R. C. Beineke, 626 Broadway, Cincinnati 2.

● **CONNECTICUT:** Organized 1940. Headquarters, New Haven, Conn. Meets, Third Thursday. PRESIDENT, A. J. Lawless, 110 Whitney Ave., New Haven. SECRETARY, R. W. Sidbury, 236 Grand St., Waterbury 91.

● **DELTA:** Organized 1939. Headquarters, New Orleans, La. Meets, Second Tuesday. PRESIDENT, Theodore Offner, 1000 S. Peters St., New Orleans. SECRETARY, H. L. Salaun, 317 Baronne St., New Orleans.

● **EMPIRE STATE CAPITAL:** Organized 1951. Headquarters, Albany, N. Y. PRESIDENT, D. A. Carofano, 1821 Highland Ave., Troy. SECRETARY, G. G. Davis, 323 State St., Schenectady.

● **GOLDEN GATE:** Organized 1937. Headquarters, San Francisco, Calif. Meets, First Thursday. PRESIDENT, T. J. Janes, University of California, Dept. of Grounds & Bldgs., Berkeley 4. SECRETARY, J. E. Murray, 1095 Market St., San Francisco 3.

● **ILLINOIS:** Organized 1906. Headquarters, Chicago, Ill. Meets, Second Monday. PRESIDENT, George W. Bornquist, 605 W. Washington Blvd., Chicago 6. SECRETARY, G. V. Zintel, 1217 W. Washington Blvd., Chicago 7.

● **INDIANA:** Organized 1943. Headquarters, Indianapolis Ind. Meets, Fourth Friday. PRESIDENT, F. C. Barton, 912 K. of P. Bldg., Indianapolis. SECRETARY, R. C. Blackman, 5505 N. Illinois St., Indianapolis 8.

● **INLAND EMPIRE:** Organized 1950. Headquarters, Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, L. E. Marque, 3803 N. Atlantic, Spokane. SECRETARY, R. J. Harris, 116 N. Division St., Spokane 8.

● **IOWA:** Organized 1940. Headquarters, Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, C. H. McGuiness, 712 Park St., Des Moines. SECRETARY, J. F. Sandfort, M. E. Dept., Iowa State College, Ames.

● **KANSAS:** Organized 1951. Headquarters, Wichita, Kan. PRESIDENT, R. F. Bauer, 434 N. Rock Island, Wichita. SECRETARY, E. G. Fahnestock, P.O. Box 2581, Hillside Station, Wichita.

● **KANSAS CITY:** Organized 1917. Headquarters, Kansas City, Mo. Meets, First Monday. PRESIDENT, C. W. Schumacher, 1920-22 Grand Ave., Kansas City, Mo. SECRETARY, G. H. Stoffer, 200 Riss Bldg., 15 West 10th St., Kansas City 6, Mo.

● **MANITOBA:** Organized 1935. Headquarters, Winnipeg, Man., Canada. Meets, Third Thursday. PRESIDENT, J. F. Bertram, 550 Notre Dame Ave., Winnipeg. SECRETARY, A. K. Piercy, 222 Osborne St., N., Winnipeg.

● **MASSACHUSETTS:** Organized 1912. Headquarters, Boston, Mass. Meets, Third Tuesday. PRESIDENT, John Bonner, 92 Broadway, Cambridge 42. SECRETARY, L. R. Geissenhainer, 89 Broad St., Boston 10.

● **MEMPHIS:** Organized 1944. Headquarters, Memphis, Tenn. Meets, Third Monday. PRESIDENT, R. E. Larkin, 515 W. Clover Dr., Memphis. SECRETARY, A. T. Bevil, 212 Robinson Bldg., 160 Union, Memphis 3.

● **MIAMI VALLEY:** Organized 1950. Headquarters, Dayton, Ohio. Meets, First Wednesday. PRESIDENT, C. D. Weaver, 1136 U.B. Bldg., Dayton 2. SECRETARY, R. W. Kimmel, 947 Westminster Pl., Dayton 9.

● **MICHIGAN:** Organized 1916. Headquarters, Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, G. W. Akers, Box 238, R.F.D. 2, Rochester, Mich. SECRETARY, R. H. Oberschulte, 316 McKerchey Bldg., Detroit 1.

● **MINNESOTA:** Organized 1918. Headquarters, Minneapolis, Minn. Meets, First Monday. PRESIDENT, E. F. Snyder, Jr., 4324 Zenith Ave. N, Minneapolis 22. SECRETARY, J. A. Holbrook, 65 North 17th St., Minneapolis 3.

● **MONTREAL:** Organized 1936. Headquarters, Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, J. G. Chenevert, 1440 St. Catherine St. W., Montreal. SECRETARY, B. J. Horsburgh, 637 Craig W., Rm. 212, Montreal.

● **NEBRASKA:** Organized 1940. Headquarters, Omaha, Neb. Meets, Second Tuesday. PRESIDENT, K. E. Martin, 204 Barker Bldg., Omaha 2. SECRETARY, O. J. Smith, 233 Grain Exchange Bldg., Omaha 2.

● **NEW YORK:** Organized 1911. Headquarters, New York, N. Y. Meets, Third Monday. PRESIDENT, Ernst Graber, 215 Hollywood Ave., Douglaston, L. I. SECRETARY, Carl H. Flink, 62 Worth St., New York 13.

● **NORTH CAROLINA:** Organized 1939. Headquarters, Durham, N. C. Meets, Quarterly. PRESIDENT, L. L. Vaughan, P. O. Box 5746, Raleigh. SECRETARY, J. W. Bunn, Jr., 2705 Lochmoor Dr., Raleigh.

● **NORTH TEXAS:** Organized 1938. Headquarters, Dallas, Tex. Meets, Third Monday. PRESIDENT, R. E. Allison, 607-11 First Ave., Dallas 10. SECRETARY, M. W. Brown, 1213 Texas Bank Bldg., Dallas 2.

● **NORTHEASTERN OKLAHOMA:** Organized 1948. Headquarters, Tulsa, Okla. PRESIDENT, C. H. Dollmeyer, Jr., 1533 N. New Haven Ave., Tulsa 15. SECRETARY, V. W. Miles, 624 So. Boston Ave., P. O. Box 871, Tulsa.

● **NORTHERN OHIO:** Organized 1916. Headquarters, Cleveland, Ohio. Meets, Second Monday. PRESIDENT, John Richmond, 10210 Woodland Ave., Cleveland 4. SECRETARY, R. G. Huebscher, 7218 Euclid Ave., Cleveland 3.

● **OKLAHOMA:** Organized 1935. Headquarters, Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, J. H. Carnahan, 320 Oklahoma Natural Gas Bldg., Oklahoma City 2. SECRETARY, W. J. Collins, Jr., 224 Oklahoma Natural Gas Bldg., Oklahoma City.

● **ONTARIO:** Organized 1922. Headquarters, Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, William Philip, 5 Barbara Crescent, Toronto, Ont. SECRETARY, H. R. Roth, 57 Bloor St., W., Toronto, Ont.

● **OREGON:** Organized 1939. Headquarters, Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, H. W. McKenzie, 399 Murray Ave., Beaverton. SECRETARY, R. P. Lankow, 3408 S.E. Hawthorne Blvd., Portland 15.

● **PACIFIC NORTHWEST:** Organized 1928. Headquarters, Seattle, Wash. Meets, Second Tuesday. PRESIDENT, R. M. Stern, 5121 E. 68th, Seattle 5. SECRETARY, H. T. Orebaugh, 1330 Dearborn, Seattle.

● **PHILADELPHIA:** Organized 1916. Headquarters, Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, E. K. Wagner, 2240 N. Broad St., Philadelphia 32. SECRETARY, A. M. Robertson, 1200 Locust St., Philadelphia 7.

● **PITTSBURGH:** Organized 1919. Headquarters, Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, W. D. Simpson, 301 Standard Life Bldg., Pittsburgh 22. SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St., Pittsburgh 22.

● **ROCKY MOUNTAIN:** Organized 1944. Headquarters, Denver, Colo. Meets, First Wednesday. PRESIDENT, B. H. Spurlock, Jr., Dept. of M. E., University of Colorado, Boulder, Colo. SECRETARY, J. W. Braak, 1230 California St., Denver, Colo.

● **ST. LOUIS:** Organized 1918. Headquarters, St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, L. L. Hamig, 1706 Olive St., St. Louis 3. SECRETARY, J. F. Naylor, Jr., 2335 S. Grand Ave., St. Louis 4.

● **SHREVEPORT:** Organized 1948. Headquarters, Shreveport, La. Meets, Third Thursday. PRESIDENT, R. M. Hood, 411 Louisiana Ave., Shreveport, La. SECRETARY, M. A. Hudson, 4609 Gilbert Dr., Shreveport.

● **SOUTH TEXAS:** Organized 1938. Headquarters, Houston, Tex. Meets, Third Friday. PRESIDENT, R. J. Salinger, 910 Bankers Mtg. Bldg., Houston 2. SECRETARY, E. G. Floeter, Jr., P.O. Box 6006, Houston 6.

● **SOUTHERN CALIFORNIA:** Organized 1930. Headquarters, Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, M. C. Greiner, 1559 Club View Dr., Los Angeles 24. SECRETARY, L. B. Davenport, 137 S. Anderson St., Los Angeles 33.

● **SOUTHWEST TEXAS:** Organized 1946. Headquarters, San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, W. E. Long, Dept. of Mechanical Engrg., University of Texas, Austin. SECRETARY, L. H. Hornor, Jr., 810 Insurance Bldg., San Antonio.

● **UTAH:** Organized 1944. Headquarters, Salt Lake City, Utah. Meets, First Wednesday. PRESIDENT, A. R. Curtis, 5158 Cottonwood Lane, Holladay. SECRETARY, M. L. Gollaher, 1165 Roosevelt Ave., Salt Lake City 5.

● **VIRGINIA:** Organized 1946. Headquarters, Norfolk, Va. Meets Third Wednesday. PRESIDENT, D. E. Phillips, P. O. Box 674, Newport News. SECRETARY, H. E. Marquart, 111 W. Main St., Norfolk.

● **WASHINGTON, D. C.:** Organized 1935. Headquarters, Washington, D. C. Meets, Second Wednesday. PRESIDENT, S. R. Allen, 942 Washington Bldg., Washington 5. SECRETARY, P. H. Loughran, Jr., 4513 49th St., N.W., Washington 16.

● **WESTERN MICHIGAN:** Organized 1931. Headquarters, Grand Rapids, Mich. Meets Second Monday. PRESIDENT, W. C. DeRoo, 500 E. 8th St., Holland, Mich. SECRETARY, P. D. Winchester, 322 Columbia Ave., Holland, Mich.

● **WESTERN NEW YORK:** Organized 1919. Headquarters, Buffalo, N. Y. Meets, Second Monday. PRESIDENT, T. F. Killeen, 374 Delaware Ave., Buffalo 2. SECRETARY, R. E. Lang, 140 Meadow Lane, Kenmore 23.

● **WISCONSIN:** Organized 1922. Headquarters, Milwaukee, Wis. Meets, Third Monday. PRESIDENT, H. F. Brinen, 2226 Kinzie Ave., Racine. SECRETARY, L. C. Plaehn, 914 N. Broadway, Milwaukee.

Student Branches

● **COLLEGE OF CITY OF NEW YORK:** Organized 1949. Headquarters, New York, N. Y. PRESIDENT, Seymour Weinberg, 2147 72nd Street, Brooklyn 4. SECRETARY, Benjamin Karp, 524 Bertiman St., Brooklyn 8.

● **LOUISIANA POLYTECHNIC INSTITUTE:** Organized 1949. Headquarters, Ruston, La. PRESIDENT, W. G. McMullen, Box 472, Tech Station, Ruston. SECRETARY, R. L. Gorton, Box 184, Tech Station, Ruston.

● **NORTH CAROLINA STATE COLLEGE:** Organized 1948. Headquarters, Raleigh, N. C. PRESIDENT, Sydney Narvey, 5-B Vetville, State College Station, Raleigh. SECRETARY, E. A. Travis, Jr., P.O. Box 3333, Bagwell Dormitory, Raleigh.

● **OKLAHOMA A. & M. COLLEGE:** Organized 1950. Headquarters, Stillwater, Okla. PRESIDENT, O. A. Brynie, 507 Midi, Vet Village, Stillwater. SECRETARY, D. W. Ray, W361 Bennett Hall, Stillwater.

● **OREGON STATE COLLEGE:** Organized 1949. Headquarters, Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. J. Kemper, Jr., 645 N. 4th, Corvallis. SECRETARY, J. M. Templer, 720 Kings Rd., Corvallis.

● **PURDUE UNIVERSITY:** Organized 1948. Headquarters, W. Lafayette, Ind. CHAIRMAN, N. J. Kirch, 922 Highland Ave., Lafayette. SECRETARY, H. F. Allen, Jr., 629 University St., W. Lafayette.

● **TEXAS A. & M. COLLEGE:** Organized 1946. Headquarters, College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, J. O. Kadel, Box 4054, College Station, Tex. SECRETARY, W. C. Haggard, Box 5227, College Station.

● **UNIVERSITY OF DETROIT:** Organized 1949. Headquarters, Detroit, Mich. Meets, First Tuesday. PRESIDENT, G. H. Williams, 18251 Washburn, Detroit 21. SECRETARY, R. H. Drake, 5598 Hurlbut, Detroit 13.

● **UNIVERSITY OF KANSAS:** Organized 1949. Headquarters, Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.

● **UNIVERSITY OF TEXAS:** Organized 1949. Headquarters, Austin, Tex. Meets. First and Third Tuesday. PRESIDENT, W. A. Cox, 360-D Deep Eddy Apts., Austin. SECRETARY, V. H. Miles. PHP Dorm J, Austin.

● **UNIVERSITY OF TORONTO:** Organized 1951. Headquarters, Toronto, Ont. CHAIRMAN, J. A. Slemin, 21 Wilberton Rd., Toronto, Ont. SECRETARY, T. O. Smith, 455 Avenue Rd., Toronto, Ont.

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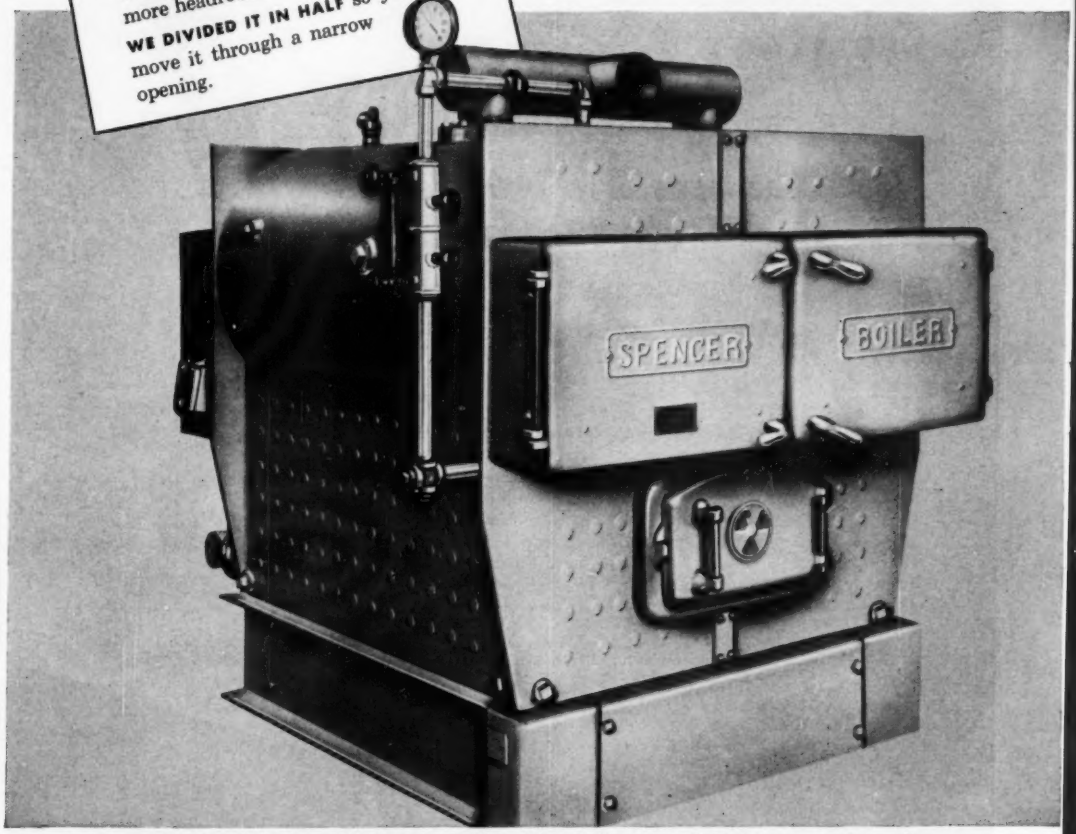

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permits installation where headroom is at a premium. Overall height of Spencer's Low-Waterline Boiler is approximately 25% less than conventional firebox boilers.

DIVIDED DESIGN

permits entry through narrow basement openings. The two watertight sections can be moved in *separately*, yet require no welding for installation and assembly.

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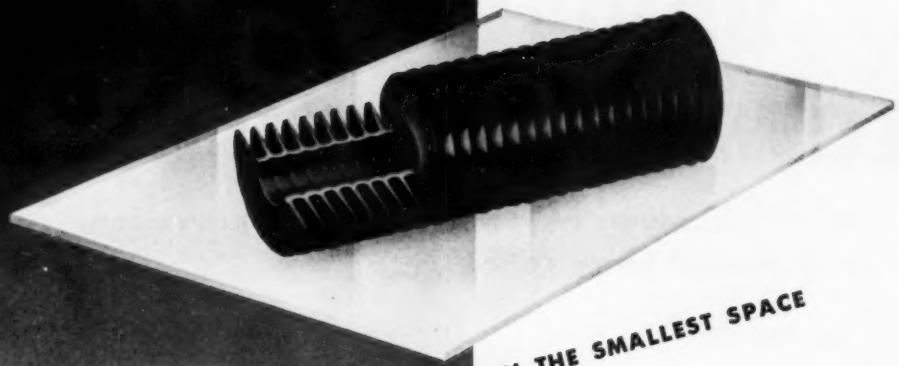

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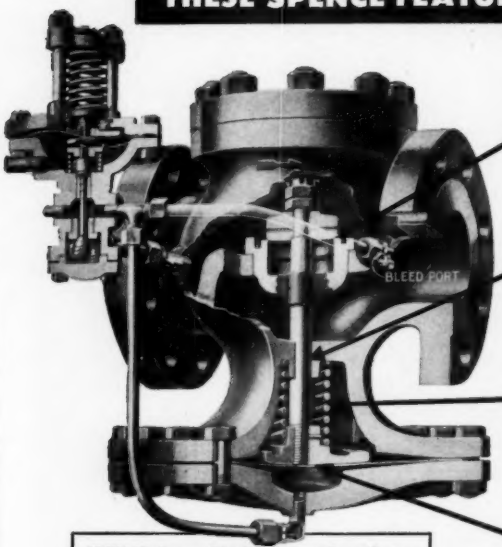

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SECO METAL SEATS AND DISCS — Durable SECO Metal resists wiredrawing. *More than twenty years of experience* in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

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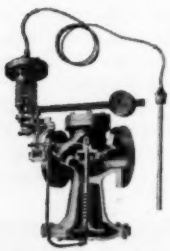
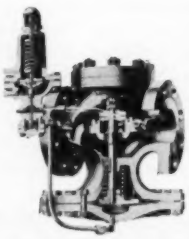
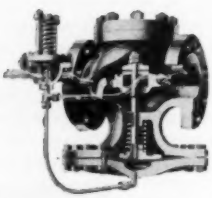
Spence Pressure and Temperature Regulators are built in sizes from *¼" to 12"* for service with *air, steam, water, oil or gas.* Only minor adjustments are needed to switch any Spence Regulator from one service to another.



Type ET150 Temperature Regulator—Tops in performance for both storage and instantaneous heaters.



Type EN Differential Regulator—Accurately controls differential between fluid delivered by regulator and some other source of pressure connected to the pilot spring chamber.



Type EQ Back Pressure Regulator — Completely packless, pilot operated for accurate control of the initial pressure.

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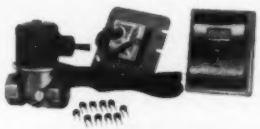

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For automatic heat at home, the General Controls T-30 Package Set is a sure short cut to economical and trouble-free comfort. Included with the graceful T-70 Timer Thermostat, is the long-proved, Type K3 Magnetic Gas Valve, Transformer and Thermostat Cable. Optional Timer Thermostat is furnished in two models, either for internal night setting (T-70-T) or with both day and night temperature selection at your finger tip (T-70-X) on the face of the sleek and satin-finished cover.

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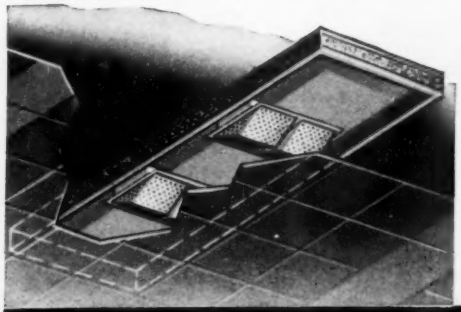

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MENOMONIE HOSPITAL, Menomonie, Wisconsin
STATE OF WISCONSIN—GENERAL HOSPITAL, University of Wisconsin
ST. JOSEPH'S HOSPITAL, Hancock, Michigan
IVINSON HOSPITAL, Laramie, Wyoming
BYBERRY STATE HOSPITAL, Tubercular Patients Building N-10
NEW MOUND PARK HOSPITAL, St. Petersburg, Florida
HEART HOSPITAL, University of Minn., Minneapolis, Minn.
JUAB COUNTY HOSPITAL, Nephi, Utah
SOMERSET STATE HOSPITAL, Somerset, Penn.
GILLETTE HOSPITAL, St. Paul, Minnesota
GADSDEN COUNTY HOSPITAL, Quincy, Florida
UNIVERSITY OF ILLINOIS, PHYSICAL ENVIRONMENT LABORATORY Urbana, Illinois
CHESTNUT HILL HOSPITAL, Philadelphia, Pa.
UNIVERSITY OF CALIFORNIA, Medical School—Teaching Hospital
PASTEUR MEDICAL BUILDING, Oklahoma City, Okla.
OAKWOOD HOSPITAL, Detroit, Michigan
COLEMAN HOSPITAL, Indianapolis, Indiana
STANISLAUS COUNTY HOSPITAL, Modesto, Calif.
UNIVERSITY OF CALIFORNIA, Virus Laboratory

✻ See SWEET'S Arch. & Eng. Files or: Write for detailed literature and the name of the Multi-Vent sales engineer in your vicinity.

Psychiatric Wards
Nurseries
Laboratories
Psychometric Rooms

Multi-Vent Ceiling Panels have been specified for the new addition to the UNIVERSITY OF ILLINOIS RESEARCH AND EDUCATIONAL HOSPITALS, Chicago
Architects • Holabird, Root & Burgee, Chicago
Consulting Engineers—Psychometric Room and Medicine Research—E. P. Hackel & Assoc., Chicago

Hospital medical staffs and technicians are rapidly recognizing that the Multi-Vent panel is *the* one air diffuser that can surely meet, even surpass, their rigid air distribution requirements for air conditioning these critical hospital areas.

The success Multi-Vent has achieved in these nurseries, laboratories, operating rooms, etc. of outstanding hospitals throughout the country, is proof of Multi-Vent's ability to provide truly perfect air conditioned comfort in offices, theatres, stores, restaurants and all other types of institutional or commercial buildings . . . where the best in air distribution is desired.

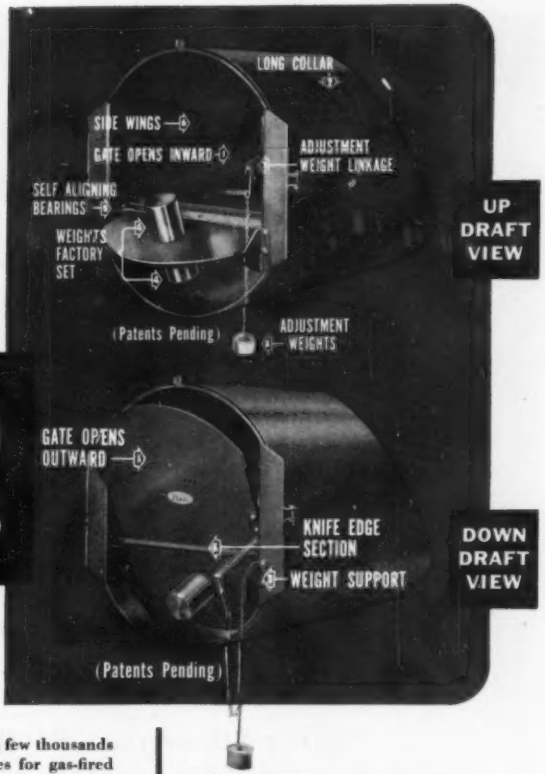
Multi-Vent's unique pressure displacement principle of air distribution is completely free from BLOW or THROW (high velocity injection), the main source of draft hazards . . . thereby eliminating all of the most serious installation, balancing, and adjustment problems inherent in the velocity injection principle upon which all air diffusers except Multi-Vent depend.

MULTI-VENT DIVISION **THE PYLE-NATIONAL COMPANY**
1373 N. KOSTNER AVE., CHICAGO 51, ILL.

Now ... a *field* BAROMETRIC DRAFT CONTROL FOR COMMERCIAL & INDUSTRIAL

GAS FIRED HEATING PLANTS

(Not yet available in domestic sizes)



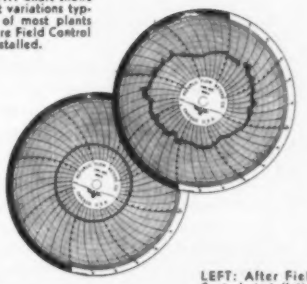
The Field "M-G" Double Acting Draft Control brings greater efficiency, greater economy to gas fired heating plants through extremely accurate control of drafts. The double-acting gate opens inward to regulate up-drafts, and outward to relieve internal or down-draft pressures as small as a few thousands of an inch. This newest Field Draft Control provides for gas-fired heating plants the same accuracy, sensitivity and dependability that have made Field Draft Controls first in the coal and oil-fired fields. Write today for detailed specifications.

FIELD CONTROL DIVISION

of H. D. Conkey & Company, MENDOTA, ILLINOIS

In case of prolonged down draft or blocked flue, an optional auxiliary switch can be mounted on the control and wired to shut off the burner, thus providing protection against the escape of carbon monoxide into the building.

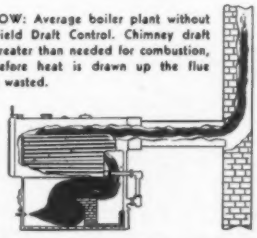
RIGHT: Chart shows draft variations typical of most plants before Field Control is installed.



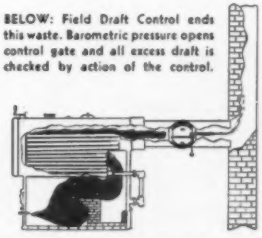
LEFT: After Field Control installation the breeching draft is held constant.

Why a Field Draft Control:

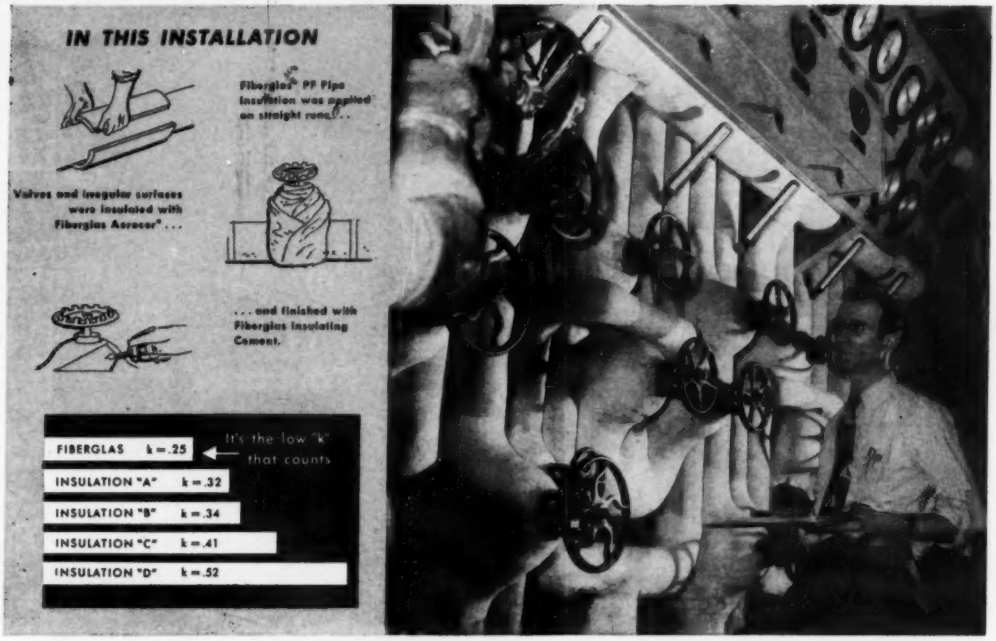
BELOW: Average boiler plant without a Field Draft Control. Chimney draft is greater than needed for combustion, therefore heat is drawn up the flue and wasted.



BELOW: Field Draft Control ends this waste. Barometric pressure opens control gate and all excess draft is checked by action of the control.



CONTROLLED DRAFT BY *field* BAROMETRIC CONTROLS


IN THIS INSTALLATION
Fiberglas* PF Pipe insulation was applied on straight runs. . .
Valves and irregular surfaces were insulated with Fiberglas Aerocor* . . .
. . . and finished with Fiberglas Insulating Cement.
FIBERGLAS k = .25
It's the low "k" that counts
INSULATION "A" k = .32
INSULATION "B" k = .34
INSULATION "C" k = .41
INSULATION "D" k = .52

Save up to 25% more BTU's per dollar with Fiberglas PF Pipe Insulation

It's the "k" that counts. Fiberglas* PF Pipe Insulation is first in efficiency among molded materials for service up to 450° F. As the little chart above shows, the low heat conductivity "k" of Fiberglas Insulation gives superior protection when equal thicknesses are used . . . or in many cases you can use less thickness than with other insulations to obtain equal protection. Either way your costs are lower.

Fast, easy application is another way Fiberglas PF saves money. Available with canvas jacket for indoor use, or with weatherproof jacket for outdoor. *New form* is Fiberglas Dual Temperature Pipe Insulation. Its laminated jacket provides an integral vapor barrier for indoor lines that carry hot water one season and cold water another; or for continuous low-temperature service.

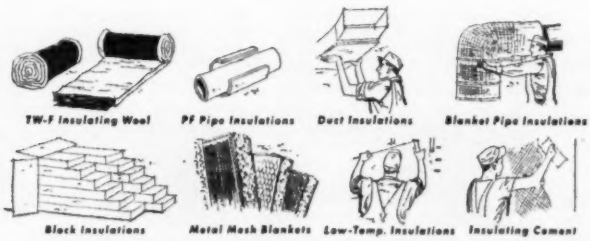
Where heat or cold must be controlled, count on these unique features of Fiberglas Industrial Insulations to produce top results . . . in less time, at lower cost:

- High insulating value
- Light in weight
- Easy to cut and apply
- Economically priced
- Ageless, rotproof
- Non-corrosive
- Low moisture pickup
- Will not shrink

Your Fiberglas Insulation Contractor is ready to put these advantages to work for you. For his name, see the yellow pages of your phone book, or call the nearest Fiberglas Office. OWENS-CORNING FIBERGLAS CORPORATION, Dept. 40-D, Toledo 1, Ohio.

*Fiberglas (Reg. U.S. Pat. Off.) and Aerocor are trademarks of Owens-Corning Fiberglas Corporation for products made of or with fibers of glass.

OWENS-CORNING
FIBERGLAS
INDUSTRIAL INSULATIONS
...Where Heat or Cold Must be Controlled!



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NEW All-Purpose Gate Valve

No. 90 R-P&C Bronze Solder End Gate Valve

• Use it for hot and cold water lines or low pressure steam—in plumbing, heating, and air conditioning systems—in homes, apartments, restaurants, offices, stores, hospitals, industrial plants.

The strong, amply-sectioned body will not distort nor will seat warp under soldering temperatures. The R-P&C Bronze Solder End Gate Valve has full, unobstructed flow. For use with K, L, and M copper tubing. Working pressures: steam —125 lbs.; cold water, oil, or gas (non-shock)—200 lbs.

Your R-P&C distributor has them—or can get them for you. Your nearest R-P&C district office will gladly furnish details of this and other R-P&C Valves. Call your distributor or write us today.

R-P&C valves

ACCO

TRADE MARK

R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

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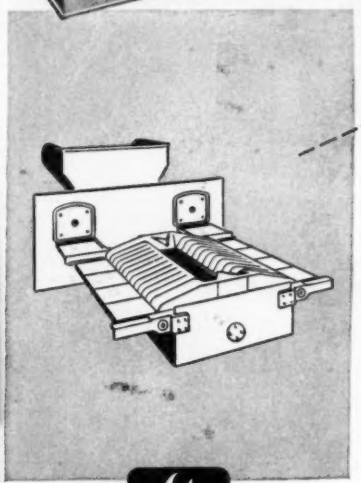
Why not buy a stoker that will burn either...

ANTHRACITE

or

BITUMINOUS



The C-E Skelly Stoker will burn satisfactorily *all* grades of bituminous coal as well as the smaller sizes of anthracite. Think what this means in terms of lower fuel bills. No longer are you limited to the more expensive, better grades of coal. The C-E Skelly Stoker permits the use of the most economical type of coal available in your locality. This flexibility in the choice of coals enables you to keep your heating costs at a minimum. In fact, it makes your purchase an *investment* rather than an *expense*.

When you consider that the cost of fuel burned on a stoker often greatly exceeds the initial cost of the stoker itself, it becomes quite evident that the range of coals a stoker will burn *effectively* is a far more important consideration than the purchase price.

Moreover, the C-E Skelly Stoker assures top performance with minimum maintenance. For this stoker reflects the practical knowledge of fuels and operating conditions that Combustion has acquired in installing over 20,000 stokers of all types above residence size.

You can turn to C-E with complete confidence that you are purchasing a stoker that you can rely upon for years of dependable, economical service. Why not investigate the C-E Skelly Stoker for your next installation? B-566

C-E

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

COMBUSTION ENGINEERING — SUPERHEATER, INC.

200 Madison Avenue, New York 16, N. Y.

Give your customers the most for their ductwork dollars with

U·S·S Galvanized Steel

● Your ductwork customers expect clean, neat jobs that will give them the longest possible service. You can meet their requirements best with U·S·S Galvanized Steel Sheets.

The working qualities of U·S·S Galvanized Steel make it suitable for even the most complicated jobs. You can bend, roll, cut or stamp it quickly and easily. It can be soldered without difficulty. The zinc coating provides lasting protection for the steel beneath.

When you combine quality workmanship with high-quality U·S·S Galvanized Steel Sheets, your jobs give complete satisfaction and lead to repeat orders. Your customers know the U·S·S name . . . they recognize it stands for the best in steel.

U·S·S GALVANIZED STEEL SHEETS

UNITED STATES STEEL COMPANY, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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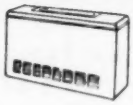
UNITED STATES STEEL

SOUTHERN HOSPITALITY by JUNG

Architects: Weiss & Silverstein
Consulting Engr.: Weil & Moses
Mech. Engr.: Mayer Godchaux

MODERN COMFORT by Marlo

Remote room air conditioning units offer complete flexibility of installation, individual room comfort control—with no ductwork needed.



Floor and ceiling units—compact, efficient—to serve any area with complete summer-winter functions.

Marlo Evaporative Condensers and Cooling Towers can be installed *indoors* (don't hog the skyline) . . . and they save up to 95% of normal cooling water demand.

The Greater Jung Hotel of New Orleans, largest hotel in the South, is now bigger and better equipped —offers its guests *the best* in service . . . comforts . . . conveniences.

That's why modern Marlo Comfort Equipment was selected for its new meeting rooms — and guest rooms — in the recently completed addition.

• These Marlo units are designed to serve your air conditioning needs . . . better! Write for information on the complete Marlo line.

Marlo
MANUFACTURERS OF

COIL CO. • 6135 Manchester Rd. • St. Louis 10, Mo.

COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS
AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

Motors from Stock

All standard sizes and speeds included

YOU DON'T HAVE TO WAIT for the motor you need. You don't have to hunt for it either, or buy an off brand. Because of greatly increased production, you can get almost any standard motor out of stock from your Allis-Chalmers Authorized Distributor or District Office.

These motors give you famous Allis-Chalmers long life features. Frame is rugged cast iron. Bearings are double shielded type. They need not be lubricated under normal conditions but can be lubricated without disassembly if required. Enclosed models have fin-type cooling systems with no enclosed external air passages to collect dirt and clog up the motor.

CERTIFIED SERVICE

Nearly a hundred Certified Service Shops, covering every industrial area in the country, offer you quick, economical factory-approved service. And Allis-Chalmers can supply your complete drive unit — motor, control and *Texrope* V-belt drive — all of coordinated design and manufacture from a single convenient source.

Save time and effort . . . get well-known, reliable equipment. For motors, control and drives, call your nearby Allis-Chalmers Authorized Distributor or District Office. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3638

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

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SOLD AND APPLIED BY AUTHORIZED DEALERS, AND DISTRICT OFFICES THROUGHOUT U. S., SERVICED BY CERTIFIED A-C SERVICE SHOPS

Allis-Chalmers Motors Carried in Warehouse Stock in these Cities:

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Chicago, Illinois
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Cleveland, Ohio
Dallas, Texas
Denver, Colorado
Detroit, Michigan
El Paso, Texas
Indianapolis, Indiana
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Los Angeles, California
Miami, Florida
Milwaukee, Wisconsin
Minneapolis, Minnesota
New Orleans, Louisiana
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Norwood, Ohio
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Portland, Maine
Richmond, Virginia
Rochester, New York
Saint Louis, Missouri
San Antonio, Texas
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Seattle, Washington
Spokane, Washington
Syracuse, New York
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Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

"Buffalo" *Tips on Better Pumping*

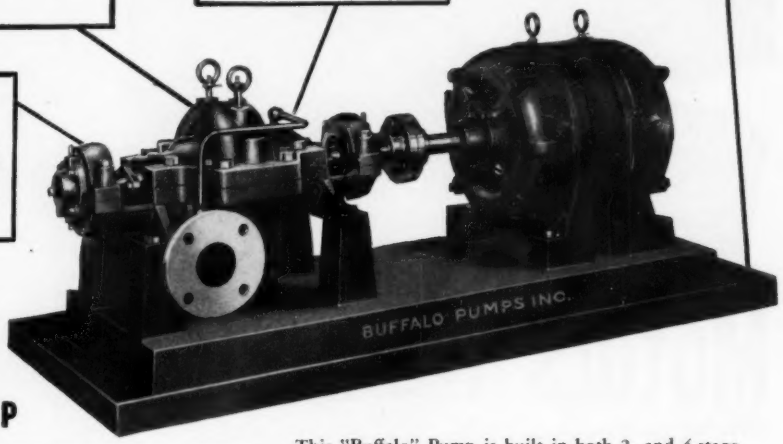
What To Look For In Choosing A Clear Water Pump

EFFICIENT ENCLOSED IMPELLERS— Built to develop required pressures.

DEEP STUFFING BOXES— large enough in this 2-stage pump to hold 7 rings of packing on each side of impellers.

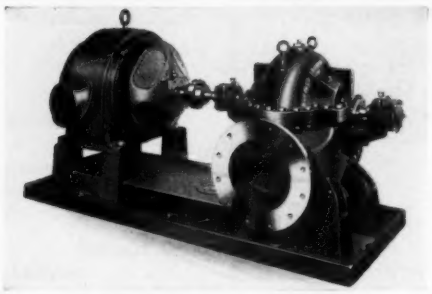
RUGGED OVERALL CONSTRUCTION— including shaft, couplings, glands and wearing rings.

ADEQUATE BEARINGS— ball bearings, Bearings on both sides of impeller as in this pump.



"Buffalo" TYPE "RR" PUMP

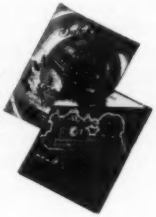
This "Buffalo" Pump is built in both 2- and 4-stage models for handling clear water at pressures as high as 500 pounds, any temperature. A highly efficient pump, it is widely used for boiler feed service. Like every "Buffalo" Pump, it is given a complete test run under actual expected operating conditions before shipment to the customer. If you are interested in a clear water pump that will give you lifetime service with a minimum of trouble and attention, specify an "RR".



"BUFFALO" TYPE "SL" PUMP

The Pump specified for many of the best-known air washers and air conditioning systems including chilled water service, the "Buffalo" Type "SL" Double Suction Pump is one of our best built models, and is available in capacities from 10 to 10,000 gpm.

For complete data on "RR" Pumps, request Bulletin 980-C and for information on "SL" Pumps, let us mail you Bulletin 955-P.



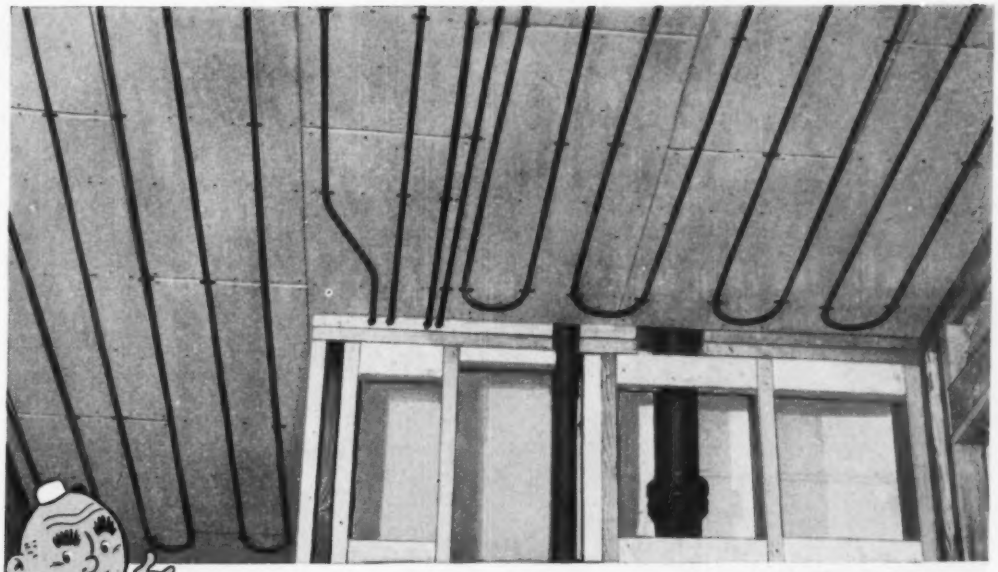
"Buffalo"

BUFFALO PUMPS INC.

171 MORTIMER STREET BUFFALO, NEW YORK

Canada Pumps Ltd., Kitchener, Ont. *Sales Representatives in All Principal Cities*

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID



Your houses, regardless of style or cost, can offer Bundyweld ceiling radiant heating

One of the most exciting, sales-producing features you can put into your houses. Today's finest heating — and tomorrow's; low in cost, easy to install.

Sales points for your houses

With Bundyweld ceiling radiant heating, your houses *feature* the most even, clean, economical, and convenient heating of all. It cuts housekeeping chores by hours; cuts fuel bills to pieces; postpones wall washing, redecorating, and cleaning of furnishings for years.

Here's heating that *truly* radiates — evenly, swiftly downward from the invisible ceiling system. Here's heating that feels natural, fresh, invigorating — as thousands of home owners will tell you.

Easy, low-cost installation

With Bundyweld Tubing, a ceiling radiant heating system is a cinch to install at low cost. Standard 24' lengths of lightweight, ductile Bundyweld (one end expanded when specified) are easily handled; quickly bent, joined, and mounted onto the ceiling; then *easily* plastered over. Low-cost Bundyweld saves you time and money on the job, gives finest radiant heating performance, too. Send coupon below for *full* details.

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

© B.T.C.

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and passed

through a furnace. Copper coating fuses with steel. Result . . . Bundyweld steel tubing, double-walled, and brazed through 360° of wall contact.

Send for your copy of handsome 20-page brochure that gives you meaty facts on Bundyweld ceiling radiant heating. (Bundy also offers this brochure to future home buyers via full-page, 4-color ads in *Better Homes and Gardens* and *American Home*.)

Bundy Tubing Company
Radiant Heating Division, Dept. HP 452
Detroit 14, Michigan

Yes! Rush me 20-page consumer brochure giving inside story of Bundyweld ceiling radiant heating ☐. I would also like a copy of Bundy trade brochure ☐.

Name_____

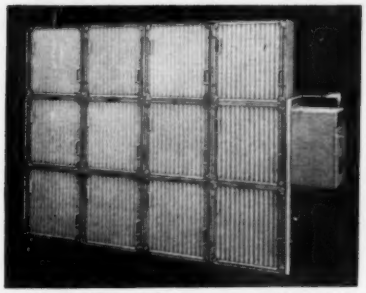
Position_____

Company_____

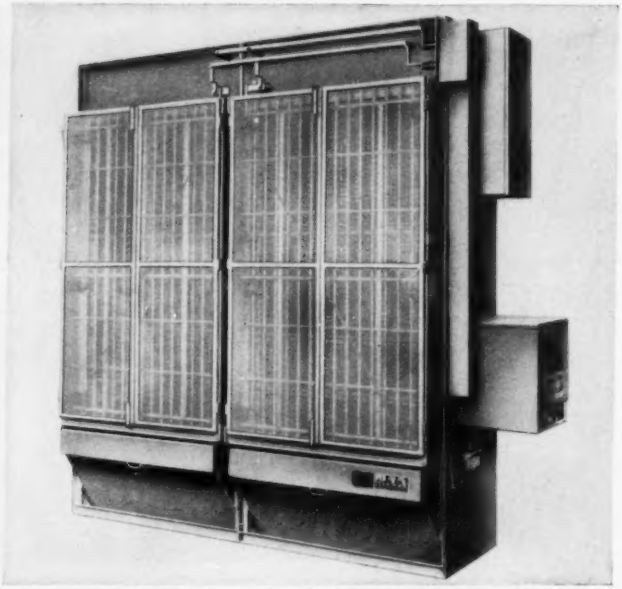
Address_____

City_____ Zone_____ State_____

A No. 11-83 Electro-Cell Precipitator with hinged ionizer opened and a few plate cells removed.



A No. 48-3 Electro-PL electronic air filter of 12,000 cfm capacity—in straight bank arrangement.



A No. 7-84 Electro-Matic Precipitator with end drive and power pack mounted on end plate of casing.

YOURS TO SELECT...

from AAF's Three Types of Electronic Precipitators

Electro-Matic . . . Electro-Cell . . . Electro-PL . . . each offers you individual characteristics and advantages . . . for cleaning air.

It all depends on your *clean air* problem! It may be degree of air cleanliness, seasonal variations in requirements, method of maintenance, velocities, capacities, or perhaps initial filter cost. Regardless of the *engineering factors* . . . when you specify AAF Electronic Precipitators you may choose a type that fits the job to the closest tolerance.

American Air Filter offers three basic electronic types each having individual characteristics of performance, maintenance and method of precipitation. These are available in many sizes, capacities and arrangements to meet virtually any *clean air* specifications you may require:

Electro-MATIC The only electronic precipitator that has a self-cleaning feature. The collector plates are automatically cleaned and reoiled every 24 hours thus maintaining highest efficiency at all times over a wide range of particle sizes . . . from smoke to largest air-borne material. Available in any practical size or capacity.

Electro-CELL A washable plate-type electronic precipitator with removable cells. Its exclusive design with full-height hinged ionizers and sectional construction conserves space while providing highest air cleaning efficiency. Available in any practical size or capacity.

Electro-PL A unique dry-type electronic filter designed to provide intermediate air cleaning efficiency with maximum economy. Its charged Airmat media has twice the efficiency of uncharged dry-type filters. The Electro-PL is dual purpose and may be operated as either a dry-type filter or with the electronic feature as seasonal conditions vary. Available in standard units for straight or "V" bank arrangements to meet any air volume requirements.

To solve your *clean air* problems electronically *call* your nearby AAF representative or write us today for Engineering Bulletin #510.

PERFORMANCE CHARACTERISTICS OF AAF ELECTRONIC PRECIPITATORS

Type	Efficiency-Velocity Ratio	Resistance-Velocity Ratio
ELECTRO-MATIC automatic, self-cleaning, supplies super-clean air.	85% at 500 fpm 90% at 400 fpm	.32" wg at 500 fpm .20" wg at 400 fpm
ELECTRO-CELL washable, plate-type with removable cells.	85% at 400 fpm 90% at 333 fpm	.29" wg at 400 fpm .18" wg at 333 fpm
ELECTRO-PL low-cost, dry-type, dual-purpose.	60% at 35 fpm	.12" wg at 35 fpm (Initial Resistance of 6 ply Type S Airmat)

AAF

American Air Filter

COMPANY, INC.

373 Central Avenue, Louisville 8, Ky.

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Offices, San Francisco, California

Success Story [OVER 20 YEARS ENGINEERING KNOW-HOW AND EXPERIENCE
OVER 18,000 SUCCESSFUL INSTALLATIONS FROM COAST TO COAST

The HEART of any Air Conditioning Unit is the COIL

ALL COPPER FINS AND TUBES
TUBES BOTH EXPANDED AND SOLDER BONDED TO FINS
TIN DIPPED HEADERS
⅝" OD TUBES IN STAGGERED ROW CONSTRUCTION
EXPENSIVE SIL-FOS USED FOR SOLDERING
ALCO EXPANSION VALVE INCLUDED
DISTRIBUTOR HEAD METERS REFRIGERANT EXACTLY THROUGH ENTIRE COIL
FLOOR MODELS 600 CFM TO 2,200 CFM
ZEPHYR 600 CFM
UTILITY MODELS 1,000 TO 3,000 CFM
CENTRAL PLANTS 4,000 TO 12,000 CFM

HASTINGS Air Conditioning Units feature Coils with 100% Copper Fins and Tubes

HASTINGS
AIR CONTROL . . . THE PROVEN ECONOMY LINE THAT BUILDS PROFITABLE YEAR-ROUND VOLUME

- All Direct Expansion Models are equipped with Alco Expansion Valves
- Water units with 6-row coils for use with city water at 60° or less; chilled or well water — from 600 to 12,000 CFM
- Each unit complete with motor, drive and filters
- No other coils have all the HASTINGS qualities which contribute to MAXIMUM EFFICIENCY and long life.

EASY SELECTION
Engineering design and capacity ratings permit quick and simple selection of equipment for the job.
COMBINATION cooling and heating units for steam or hot water.

GAS UNIT HEATERS
Complete line 75,000 to 200,000 BTU.
AGA approved.

IMMEDIATE DELIVERY

INVESTIGATE NOW
We guarantee that you will find the line of HASTINGS COOLING, HEATING AND VENTILATING EQUIPMENT to be exceptional in performance, quality and appearance.

AIR CONTROL, INC.
SALES DIVISION OF HASTINGS AIR CONDITIONING CO.
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We are interested in HASTINGS equipment, please send:
Catalogue on ____DX, ____Water, ____Gas Unit Heaters
Prices on ____DX, ____Water, ____Gas Unit Heaters
We are a ____Dealer, ____Distributor, ____Sales Agent
(DESIRABLE TERRITORIES AVAILABLE)
Name ____
Address ____ City ____ State ____
(PLEASE ENCLOSE YOUR LETTERHEAD WITH INQUIRY)

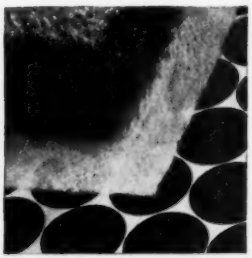
it pays to sell the Profit Line!

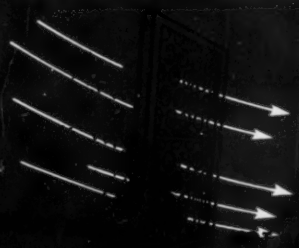
3 PRODUCTS—30-50% MORE PROFIT

Glasfloss is a *complete line* of glass fibre disposable Air Filters—not a *single* type. With the Glasfloss Line, you sell the right filter for every clean air filtering problem, and make 30% to 50% more profit. There are 3 products—3 profits—all backed by a promotional campaign that hits hard to help you sell.

1 Glasfloss I-S TYPE

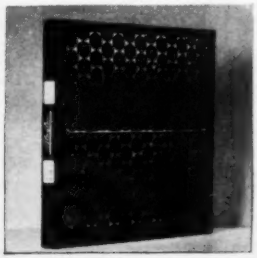
For peak air filtering efficiency, the GLASFLOSS I-S Air Filter Unit is the answer. Here a strainer mat has been added to the famous long, glass fibres that make up the standard GLASFLOSS Air Filter pad. The combination brings air filtering efficiency to as high as 95%. No other air filter on the market can compare. Figured on Peak Efficiency you win with Glasfloss.





2 Glasfloss STANDARD TYPE

This is the conventional type—the filter most in demand. The long, fine glass fibres provide a greater surface area to catch and hold more dust with less air resistance. The Glasfloss STANDARD Filter is primarily intended for home heating equipment and normal industrial installations. Available in all standard sizes. Competitively priced to beat the field.



3 Glasfloss ROLL-PAK TYPE

Here is a product carefully planned for bulk users. Cut your own filter pads—fit them into your own frames and save, with every change, as much as 30% of your normal air filter costs. Available in rolls, 40″ wide and 10′ long and 1″ and 2″ thickness. Application is easy. Just roll it out, cut to size and put into position. The fluffy, fine fibres are easy on the hands. For Economy in bulk usage it's Glasfloss all the way.

Glasfloss 155 EAST 44TH STREET, NEW YORK 17, N. Y.

Ice Cold Drinks are on the House!

The
BISCAYNE
TERRACE
HOTEL
in MIAMI

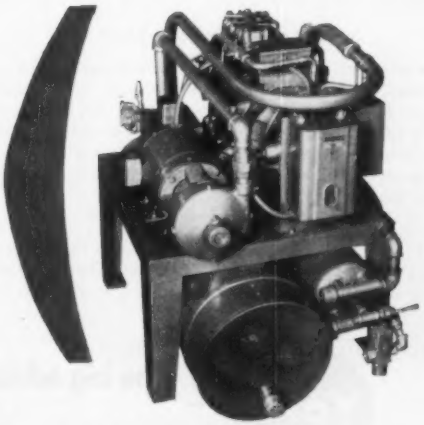
—*thanks to the Acme FLOW-COLD* packaged liquid chiller*

The beautiful Biscayne Terrace Hotel in Miami, Florida has insured happier moments for its guests by the installation of a 5 horsepower Flow-Cold Liquid Chiller to provide chilled drinking water in all the 200 rooms and bubbler outlets in the lobby.

This installation becomes truly remarkable when you realize that the Flow-Cold servicing all these outlets is so compact that it takes up only twelve square feet of floor space and stands only three feet high.

You can provide the same degree of liquid chilling efficiency for your customers simply by specifying the Acme Flow-Cold Packaged Unit. It is the most versatile and compact unit on the market. It is being used successfully for air conditioning industrial coolant cooling, as a heat pump, or for solution cooling, as well as for chilling drinking water. Write us today for more complete information on the variety of duties the Flow-Cold can perform.

*Trade Mark



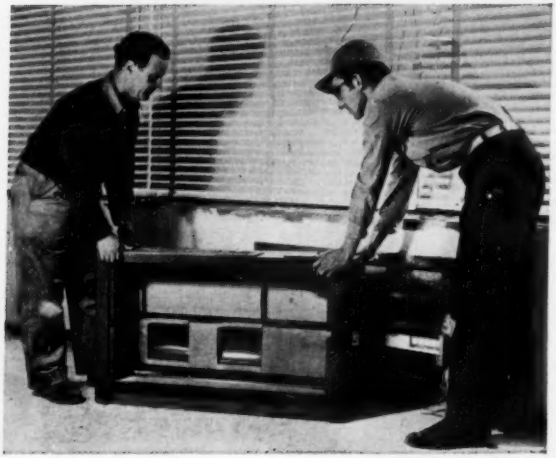
ACME PRODUCTS

ACME INDUSTRIES, INC., JACKSON, MICHIGAN

Flow Cold Division

CONTINUOUSLY SERVING THE AIR CONDITIONING AND REFRIGERATION INDUSTRIES SINCE 1919

YORK *Unitary* AIR CONDITIONING



A Major Advance in Multi-Room, Multi-Story Air Conditioning

York Unitary Air Conditioning is a system of individually controlled unit room air conditioners for heating or cooling, with water from a central point.

Lower Installation Costs

York Unitary Air Conditioning can be installed in existing buildings where space is at a premium or the cost of ductwork prohibitive—or in buildings under construction where the required number of units can be installed more economically than a central system.

Only three pipes are required—water supply and return, and drain. To facilitate piping, both right and left hand units are available. Each York Unitary Air Conditioner has an outside air plenum which allows you to locate the outside air intake anywhere from window sill to floor level.

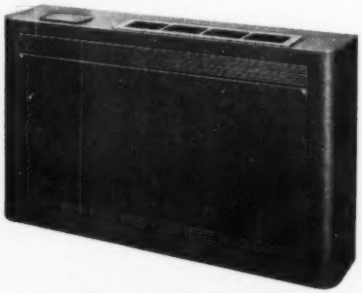
Lower Operating Costs

Each York Unitary Air Conditioner has its own controls. During holidays, weekends, nights when only a few tenants are present, only part of the system need be operated to condition the spaces actually occupied. Cleaning and redecorating costs are kept to a minimum because all air—recirculated as well as outside air—is filtered.

Minimum Space Required

In the engine room, only space for a central water cooling system is needed. No air handling equipment is necessary. In the rental area, the compact York Unitary Air Conditioner takes up little space . . . can be partially recessed into the wall.

Your nearby York Representative will be glad to show you how this latest York advance in more economical, more efficient air conditioning can save you time and details . . . save your client money and space. See him today or write York Corporation, York, Pennsylvania.



York Unitary Air Conditioner

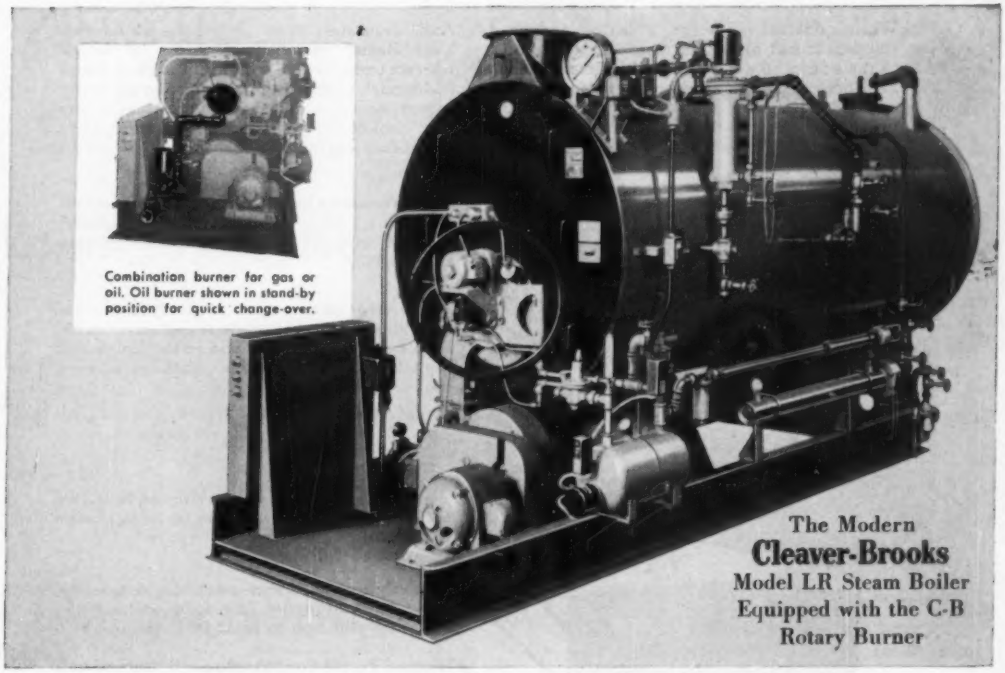
Model CF-300 illustrated. Built in sizes with capacities from 5000 to 14,000 Btu's/hr. Contain direct connected centrifugal fans, water coils, and filter. Factory assembled and tested.

York refrigeration air conditioning

The big advances come from YORK

Headquarters for— **Refrigeration and Air Conditioning**

unmatched Flexibility of operation ...and of quick fuel change-over



Combination burner for gas or oil. Oil burner shown in stand-by position for quick change-over.

The Modern
Cleaver-Brooks
Model LR Steam Boiler
Equipped with the C-B
Rotary Burner

✓ **Quick Steaming—Fast, effortless response to fluctuating steam demands**

✓ **Equally high efficiency using heavy No. 6 oils (or lighter oils) and all types of industrial gas**

IF the quantity of steam required in your plant fluctuates throughout the day, depending upon the amount of steam-using equipment in operation, you can cut your steam costs substantially with a Cleaver-Brooks Boiler. It operates at a full 80% guaranteed efficiency whether you require maximum load use of all steam-using equipment. . .or whether your equipment is not in use, requiring as little as 30% response—often just enough to heat the plant.

Install a Cleaver-Brooks Boiler — oil, gas, or combination — either fuel properly proportioned by the exclusive Cleaver-Brooks Burner to meet your fluctuating or constant steam demand. Fully automatic, clean, with a single source for all of its matched parts . . . you benefit with lower fuel bills, less maintenance, reduced operating costs, greater profits. Why not consider changing your present boiler plant and think of flexibility — remember Cleaver-Brooks and get the complete facts on boilers, 15 to 500 HP — 15 to 250 lbs. psi.

Write for latest, fully illustrated and descriptive Cleaver-Brooks Steam Boiler catalog.

Cleaver-Brooks
STEAM BOILERS
the first and finest of their class

CLEAVER-BROOKS COMPANY
Dept. D, 312 E. Keefe Ave., Milwaukee 12, Wis., U. S. A.
Cable Address: Clebro-Milwaukeewis

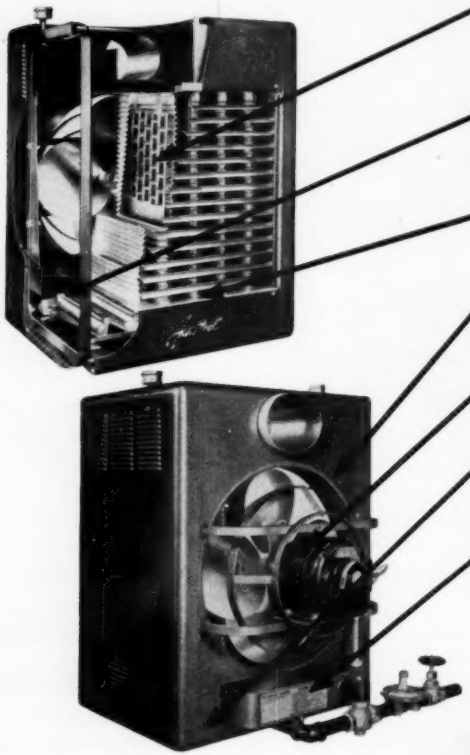
Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners

Features that are a result of

®Janitrol *Complaint-Free Engineering*

While constant laboratory research and development has made the major contribution to the advanced design of Janitrol equipment . . . Complaint-free engineering is also a result of 26 years of intensive field studies of actual unit heater installations to provide better performance and lower maintenance costs.

And, thousands upon thousands of Janitrol Unit Heater installations, many of which operate under severe conditions such as found in foundries, machine shops and many heavy industries attest to the plus performance you can confidently expect from Janitrol complaint-free engineered equipment.



Multi-Thermex heat exchangers with internal turbulator baffles provide fast heat transfer, long life assured by use of special chrome alloy steel.

Ampli-Fire ribbon burners produce a clear blue, short flame, operation is extremely quiet. Each burner is centered within the lower end of each heat exchanger for compactness, even heat distribution.

Automatic Safety Pilot assures positive ignition, more than 100,000 installations prove its dependability.

Direct-a-Flow principle provides an equalized air flow over all heat transfer surfaces, design eliminates possibility of hot spots.

Special Design Motor and Fan Assembly, balanced combination features extra long life, quietness and heat to floor performance.

Hinged Panel Construction—Bottom of unit swings down to provide easy accessibility for burner inspection and primary air shutter adjustment.

Streamlined Enclosure protects all electrical connections of motor, safety pilot, electric gas valve and overheat control.

***WRITE** for your copy of the "Businessman's Blue Book of Better Heating," it illustrates and diagrams how unit heaters are best installed for greatest efficiency.*

®Janitrol

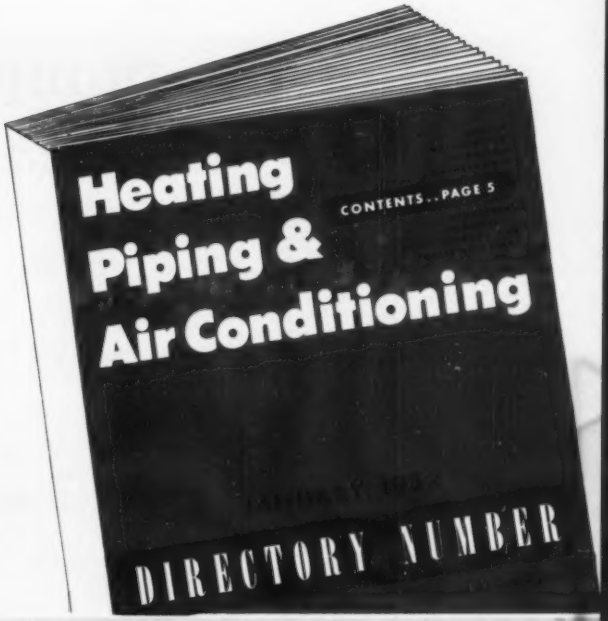
THE MOST COMPLETE LINE OF

GAS UNIT HEATERS

operate with all gases including L.P.

SURFACE COMBUSTION CORPORATION • TOLEDO, OHIO

An Added Service for Both Subscribers and Advertisers



The Directory and Product Data Sections of Your January '52 Issue

● **Field surveys show us that our subscribers KEEP their Annual Directory Numbers of HP&AC throughout the year** . . . for there is a wealth of valuable data in the January issue as you undoubtedly have already discovered.

● **The Directory Section lists every known product** used in the entire field of large building (industrial, commercial, institutional, and public) heating, piping and air conditioning . . . and where it can be obtained. We try to make this reference section absolutely complete and accurate.

● **The 1952 January Directory Number is of even greater value** to our readers than preceding issues . . . and we imagine you know why!

● Yes, you are right! In the 1952 issue more manufacturers than ever before have taken advantage of their opportunity to furnish product information in complete form. Now, in many instances, **you have complete factual data on the products you wish to specify and use** without lifting the phone or writing a letter.

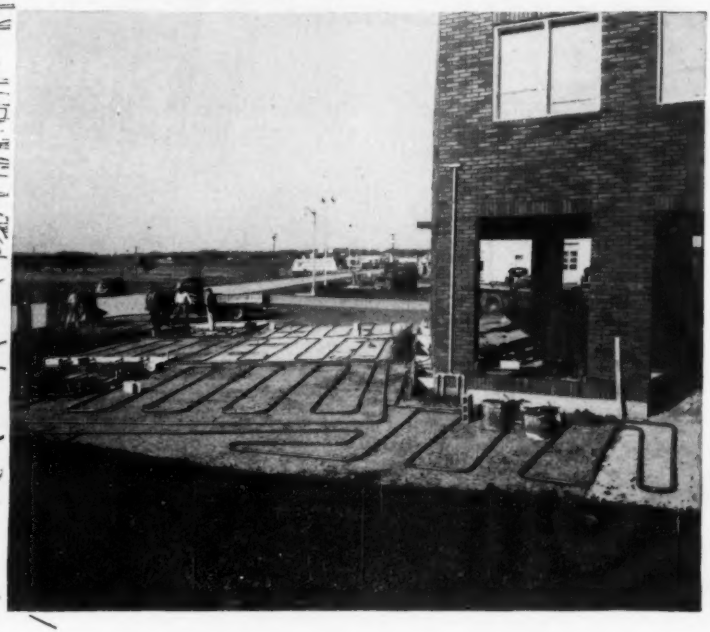
● Sincerely we feel that the Annual Directory Number of HP&AC, by providing a place **where producers of equipment can tell their entire product story,** serves both subscribers and manufacturers equally well . . . You have available comprehensive product information important to your work, while manufacturers at reasonable cost are able to acquaint approximately 18,000 key engineers and contractors with ALL the merits of their equipment and services.

● **We hope that next year, in the 1953 Directory Edition, still more manufacturers will be present with complete product data. We believe that our advertisers by helping you 100% help themselves in the same ratio.**

FIRST *in Editorial . . . in Circulation . . . in Advertising*

Man the pumps

and let 'er snow!



Service stations with steel pipe snow melting get the business

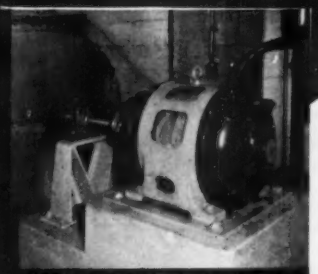
It takes a constant flow of cars at the gas pumps to keep a modern service station operating profitably, for traffic and sales go hand-in-hand. Anything that interferes with the station's capacity to fill 'em up and keep 'em moving, naturally reduces the profit.

Sudden and heavy snow falls that slow down normal operations, sometimes for days at a time, not only result in disgruntled customers but, perhaps, in permanent loss of business as well. It need *not* be so! Foresighted operators of service stations with steel pipe snow melting systems do "business as usual" . . . while competitors shovel!

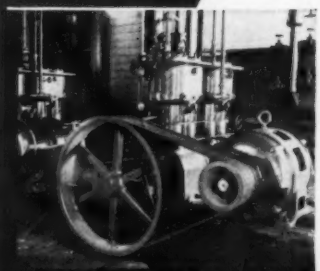
The known economy of steel pipe makes investment in a snow melting system practical for service stations, just as it does for super-markets, decentralized shopping areas and any business dependent upon automobile patronage. And in service, steel pipe has a performance record proved in more than 60 years of conventional hot water and steam heating applications. Add to this the advantages of formability and weldability for coil fabrication and you know why steel pipe is first choice for snow melting systems, too, and why it is the most widely used pipe in the world.

Steel Pipe is First Choice

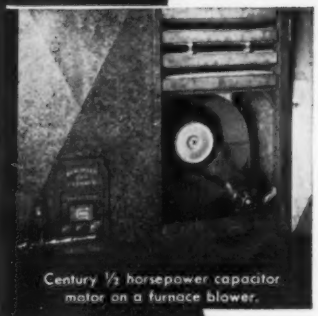
COMMITTEE ON STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 Fifth Avenue, New York 1, N.Y.



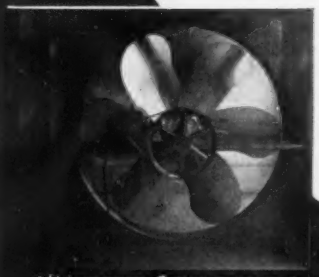
100 horsepower Century motor on a glass blowing machine.



Two 100 horsepower Century motors driving refrigeration compressors.



Century ½ horsepower capacitor motor on a furnace blower.



1/6 horsepower Century motor on a ventilating fan.

WHY Century MOTORIZED EQUIPMENT KEEPS YOUR CUSTOMERS *SATISFIED...*

The motor specifications—where skillfully selected—to assure the TOP PERFORMANCE and DEPENDABLE QUIET SERVICE that is built into each class of equipment.

Refrigeration compressors require one combination of operating characteristics and specifications—fans and blowers another combination—various types of heating equipment still another.

In over 50 years, Century has developed a wide line of types of motors with literally hundreds of specifications to choose from. It is easy to ENGINEER YOUR PRODUCT PERFORMANCE—THROUGH SKILLFUL MOTOR APPLICATION.

If you have motor service problems, phone or write to any of Century's 28 District offices regarding Century's national network of service stations—the motor exchange plan will serve you whether your motors are in or out of warranty.

Specify Century Motorized Equipment—get top equipment performance—dependable quiet service—keep your customers satisfied.

CENTURY ELECTRIC CO
1806 Pine Street • St. L

Century MOTORS

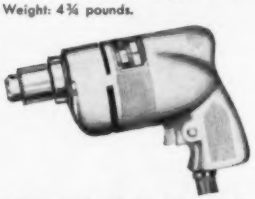
Another 20 year user praises SKIL tools

"SKIL Portable Tools are the most dependable tools in our shop!"

—says Sidney Zimmerman, general superintendent,
J. F. ZIMMERMAN & SONS, Dallas, Texas

The J. F. Zimmerman & Sons organization, manufacturer of electric neon signs, has been using SKIL Tools for more than 20 years. Mr. Zimmerman gives his unqualified approval of SKIL performance under all kinds of working conditions. He says, "SKIL Tools have made a big contribution toward production in our shop. We give them real punishment, and they keep right on giving back the kind of performance that built the SKIL reputation. And I *say* this," adds Mr. Zimmerman, "based on our long experience with these tools!"

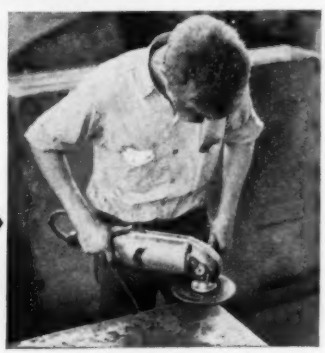
SKIL Drill—Model 241. ¼" Special Duty drill. Capacity: 0" to ¼" in steel; 0" to ½" in hardwood. Speed: 2250 r.p.m. no-load. Overall length: 11¼". Weight: 4¾ pounds.



SKIL Drill—Model 45. Compact ¼" Standard Duty drill. Capacity 0" to ¼" in steel; 0" to ½" in hardwood. No-load speed: 1800 r.p.m. Overall length: 6⅝". Weight: 3 pounds.

Doyle Hamlin uses a Model 241 SKIL Drill in the fabrication of a base and letter neon sign. He says, "I've used electric tools for 26 years, and no other drill compares with a SKIL Drill. They are compact and very powerful, easiest to handle of them all!"

Donald McCaa removes corrosion from a piece of sheet metal with a SKIL Disc Sander. He says, "SKIL Disc Sanders fill a wide number of uses in our shop. We use them for all kinds of finishing, cleaning and grinding with best results."



See your distributor for complete information or call your nearest SKILSAW factory branch

SKIL PORTABLE TOOLS

SKIL products are made only by SKILSAW, Inc. 5033 Elston Avenue, Chicago 30, Ill.

SKILSAW Factory Branches in 34 Principal Cities
In Canada: Skiltools, Ltd.
3601 Dundas Street West, Toronto 9, Ont.

LADISH

Controlled Quality

PIPE FITTINGS

reduce piping assembly time

Makeup goes smoother... with less chance for delay... on those piping systems where Ladish fittings are installed. Ladish Controlled Quality makes the difference. By exacting controls over materials and manufacturing processes... Controlled Quality assures uniform weldability through metallurgical integrity, fast assembly through dimensional accuracy and provides a real assurance of ultimate operating economy and complete dependability... reasons why it pays to specify LADISH.

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

LADISH CO.

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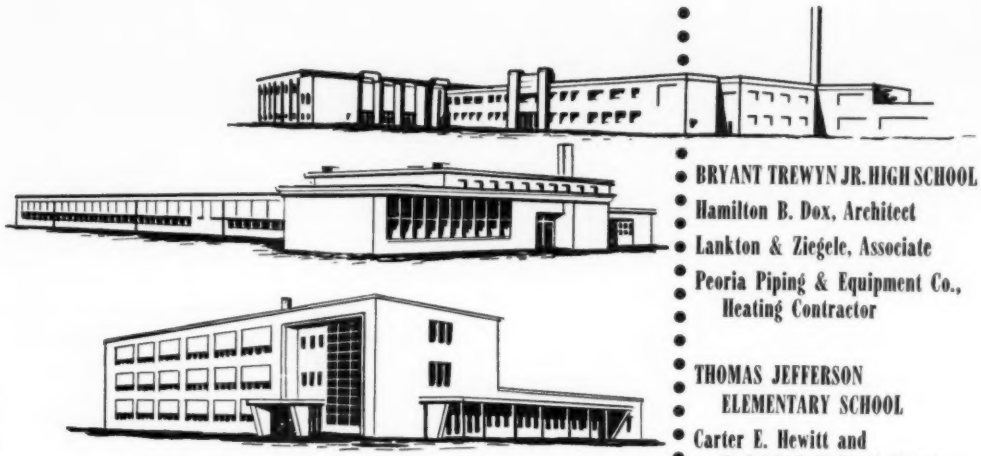

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Lankton & Ziegele, Associate
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THOMAS JEFFERSON ELEMENTARY SCHOOL
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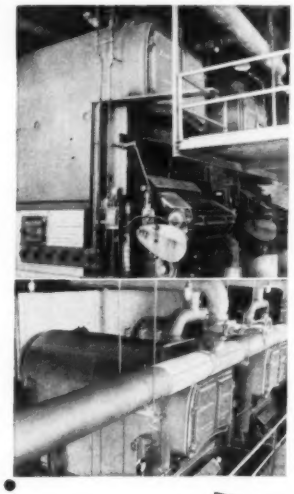
A Trio of Peoria's Finest . . . all Heated by

KEWANEE

STEEL BOILERS

Considering the many fine boilers built in America today, it is significant that Kewanee Boilers are predominantly preferred for heating the finest schools and other large buildings.

Kewanee Type "C" Boilers (stoker fired) were selected for each of these fine modern schools. The boiler rooms of two of them shown at right.



KEWANEE BOILER CORPORATION
KEWANEE, ILLINOIS
Eastern District Office: 40 West 40th St., New York City 18
Division of American Radiator & Standard Sanitary Corporation

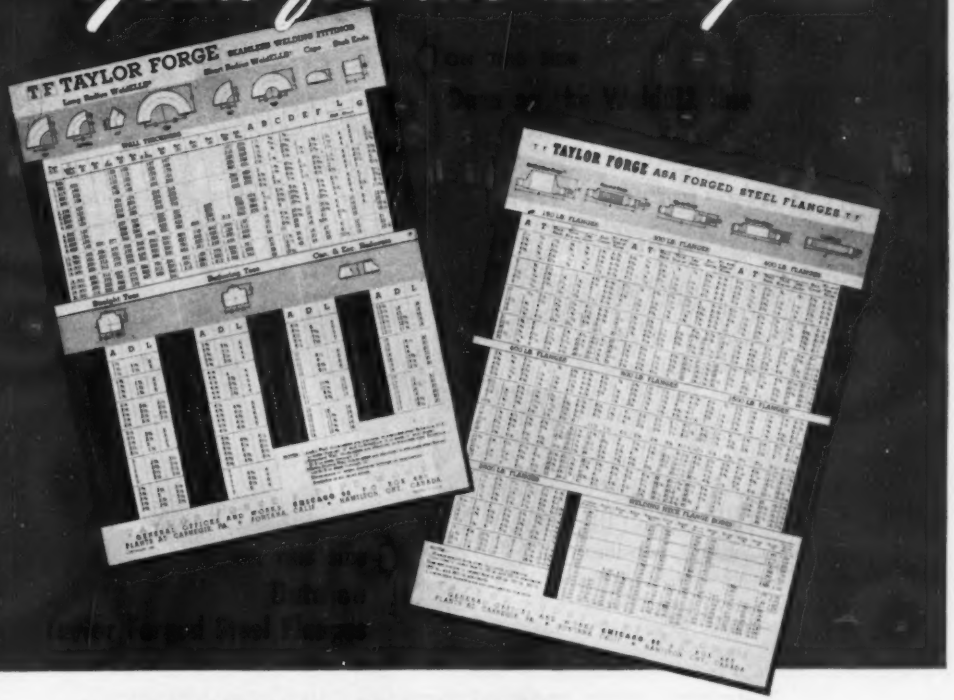
KEWANEE BOILERS

Heating America's Finest Buildings

Serving home and industry

AMERICAN STANDARD · AMERICAN BLOWER · ACME CABINETS · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

Yours for the asking—



A VOLUME OF DATA

. . . covering welding fittings and forged steel flanges . . .

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, ½" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, ½" through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON.**

TF

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS

General Offices and Works: P. O. Box 485, Chicago 90, Ill.
Offices in all principal cities.
Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets:

NAME_____

POSITION_____

COMPANY_____

STREET ADDRESS_____

CITY_____ ZONE____ STATE_____

510-0452 Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

"I urge every American employer to promote the Payroll Savings Plan..."

DECHARD A. HULCY, PRESIDENT
Chamber of Commerce of the United States

"I urge every American employer to promote the Payroll Savings Plan among his employees as a means of building a reservoir of savings."

As President of the Chamber of Commerce of the United States . . . with literally thousands of contacts throughout industry and commerce . . . Mr. Hulcy is uniquely qualified to evaluate the Payroll Savings Plan.

As a business man, Mr. Hulcy puts his finger on a most important accomplishment of the Payroll Savings Plan: the enormous reservoir of savings, *future purchasing power*, built up by systematic saving.

Today, millions of Americans hold Series E Defense Bonds totaling $34.7 Billion. It will surprise many to learn that this figure is $4.8 Billion greater than on V.J. Day. And the $34.7 Billion total of outstanding Defense Bonds is mounting as more and more employers recognize the importance of the Payroll Savings Plan. During 1951 there was a sizable increase in the number of men and women saving through Payroll Saving Plans where they work.

During the calendar year 1951, 45,500,000 $25 Series E Bonds were purchased – a gain of 17% over the previous year. 12,000,000 $50 E Bonds were purchased in the same period, 14% over the previous year. $25 and $50 denominations are the bonds bought by Payroll Savers.

Building a reservoir of savings and future purchasing power . . . contributing to America's defense effort . . . helping to maintain America's economic stability by providing a check on inflationary tendencies, the Payroll Savings Plan is doing a three-way job.

If your company hasn't a Payroll Plan, or if your employee participation is less than 60%, the Savings Bond Division, U. S. Treasury Department will be glad to help you take your place among America's Honor Roll of "Companies on Payroll Savings". Phone, wire or write to Suite 700, Washington Building, Washington, D. C.

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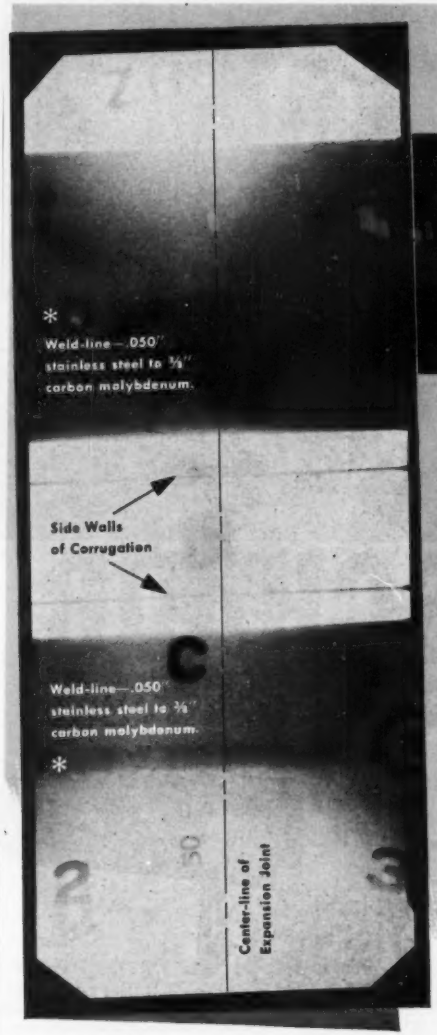

*
Weld-line—.050" stainless steel to ⅜" carbon molybdenum.
Side Walls of Corrugation
Weld-line—.050" stainless steel to ⅜" carbon molybdenum.
*
Center-line of Expansion Joint

HERE'S WHY...

you can't buy a better Expansion Joint than a ZALLEA!

When the U. S. Navy specified use of 180 Zallea Welding Type 347 Stainless Steel Expansion Joints for a steam pipe installation on a new type vessel, job requirements included X-ray examination of all joint-to-pipe welds (.050" stainless steel to ⅜" carbon molybdenum seamless pipe).

This was a rigid test, since the revealing eye of the X-ray would immediately ferret out the slightest defect or trace of slag inclusion that might cause failures at welds after the pipe line went into service.

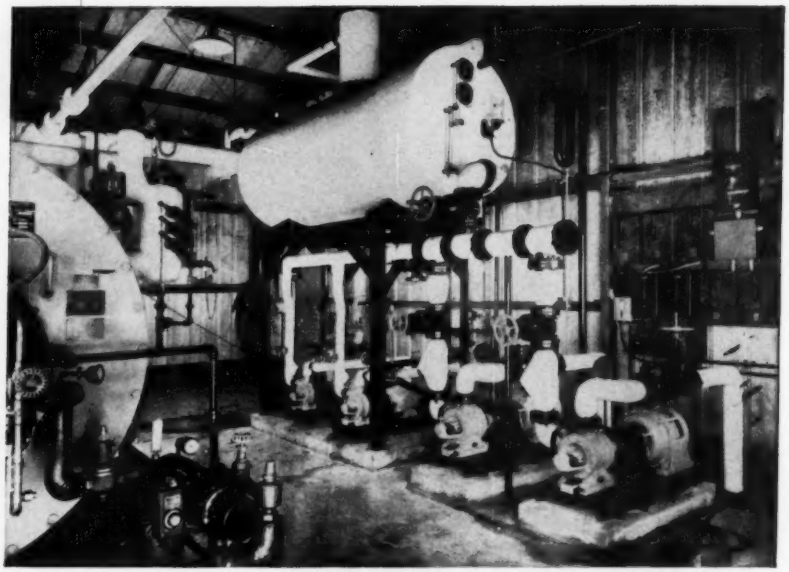
But when X-rayed, *not one* of the 360 Zallea welds disclosed any flaws or slag inclusion! In reporting test results, the independent industrial laboratory making the examination wrote: "*We have never seen more perfect welds under X-ray.*"

The exclusive Zallea *controlled* welding technique used on this job is the same technique applied in the manufacture of every Zallea Expansion Joint that leaves our plant. It's your assurance that when you buy Zallea Expansion Joints, you buy the best. They're better built . . . last *far* longer. So next time you consider expansion joints, specify Zallea . . . you'll find it pays!

Zallea Expansion Joints are available in diameters from 3 inches to 30 feet for temperatures from sub-zero to 1600° F . . . for pressures from vacuum to 300 psi in standard designs and up to 2000 psi in special designs. Zallea Brothers, 816 Locust Street, Wilmington 99, Delaware.

Write today for Catalog 47 and Bulletin 351 which illustrate all Zallea Expansion Joints.

Zallea
EXPANSION JOINTS

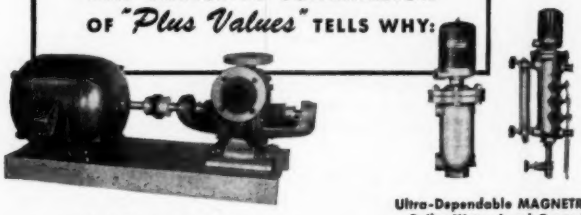


Schaub Duplex Deaerator System, installed in a new Pacific Northwest plant, handling one 100 H.P. and one 500 H. P. packaged boilers, 150 lbs. working pressure.

You Get **MORE** in a **SCHAUB**

BOILER RETURN SYSTEM

THIS EXCLUSIVE COMBINATION OF *"Plus Values"* TELLS WHY:



Schaub Master-Bilt Turbine Pump

Patented floximatic shaft seals and prelubricated ball bearings mean no packing and no greasing — *ever!* When you install a Schaub Master-Bilt Pump you can forget about it.

Ultra-Dependable MAGNETROL Boiler Water Level Control

Combination pump control and low water safety cut-off. Friction-free Magnetrol assures boiler safety. No bellows to stiffen, no packing in head, no tricky electrode circuits to fail. All models approved by Underwriters' Laboratories, Inc.

Chromosoid-Lined Receiver

10-year guarantee against corrosion. Schaub engineers developed Chromosoid lining by working with leading chemical researchers. You're protected against costly and premature replacements. No more rust-clogged systems.

Each of these, along with other features, combine to produce the high overall efficiency, economy and long-lasting service characteristic of every Schaub System. Operators who buy on the basis of facts and performance find that they get more out of a Schaub System because a Schaub System has *more to give...them.* When a Schaub System is compared with any other, the *least* difference is the difference in price! That's just another way of saying *you pay less per year for a Schaub System.*

Know the Facts! Schaub also builds Patented Heat Reclaim and Spray-Type Deaerating Systems for exacting requirements from 10 to 1000 boiler horse power. Write for new Schaub Catalog No. 55 which gives more information on all types of Schaub Systems.

FRED H. SCHAUB ENGINEERING CO.

2116 S. Marshall Boulevard **Chicago 23, Illinois**

SPANG CW

keeps West Virginia's skaters on their toes

Figure skaters never worry about the weather in Huntington, West Virginia. In their new million dollar recreational center the ice stays hard and fast all during the season. And it's kept that way day after day by a refrigerant flowing through a welded web of Spang CW Steel Pipe under the entire skating area.

Wherever long time reliability is a must—whether in skating rinks or the largest commercial buildings—architects, contractors, owners consistently specify dependable Spang CW. They know from experience that the name Spang is a guarantee of year after year of maintenance-free service.

Quality-controlled from steel to finished form, Spang CW is always uniform in every dimension. Easy to cut, easy to weld, easy to bend, it's the *easy* way to reduce installation time and costs.

Specify Spang CW Steel Pipe by name—you'll find leading distributors in every section of the country.

Owners: Cabell County Recreation Board Architect: Lewis E. Stettler
Contractors: Frick Company, Waynesboro, Pa.

SPANG

SPANG-CHALFANT

DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Grant Building, Pittsburgh 30, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

Architects: ADE and TODD Rochester, N. Y. • Consulting Engineers: ROBSON & WOESE, Syracuse, N. Y.
Heating Contractor: W. A. McCORMICK, Rochester, N. Y.

POWERS
RADIANT HEATING CONTROL

—used in many prominent modern buildings

Here is one of the nation's prominent modern schools with a radiant heating system supplemented by mechanical ventilation —completely controlled by Powers.

For flexibility of adjustment and better control the temperature regulating system is divided into six zones.

Each Zone—is heated by circulated hot water regulated by a Powers MASTROL system which controls temperature of water in relation to outdoor weather.

Ventilation for each of the six zones is supplied by large unit ventilators controlled by a Powers duct thermostat operating Flowrite valves and dampers.

Auditorium is heated by a central fan ventilating system. **Gymnasium** is heated by two large unit ventilators. Both types of ventilation circulate room air except when rooms are occupied at which time outside air is proportioned to the load. Temperature in both of these spaces, as well as in the Locker Room, is regulated by various Powers controls.

Steam Boiler Control for Varying Loads Three oil-fired boilers here are regulated by a Powers No. 252 Pneumatic Pressure Regulator controlling three PE switches which cut in the right number of boilers required for the heating load.

Powers MASTROL System of Control is ideally suited for radiant heating. It has been widely used to control many types of forced hot water heating. Performance records show it unsurpassed for reliability. Maintenance cost is practically nil.

When problems of control for any type of heating or air conditioning arise, call Powers. Our more than sixty years of experience in supplying control for important buildings may be helpful to you.

(a81)

Ceiling Coils before plastering

81 Powers Individual Room Thermostats here, control . . .

87 Powers NO-PAK Valves (packless, non-leaking type) which regulate heat in ceiling coils. Each room is provided with the temperature desired.

Powers MASTROL System of Control in each of 6 zones regulates the temperature of water circulated from steam heated hot water converters to various rooms. Temperature of water is maintained in direct relation to weather out-doors.

Powers FLOWRITE Control Valves Regulate steam to Hot Water Converters • Heating coils in Classroom Ventilators • Central Fan System in Auditorium • Large Unit Ventilators in Gymnasium.

Only a few of our many types of control for Radiant Heating are shown here.

OFFICES IN OVER 50 CITIES **THE POWERS REGULATOR COMPANY** SKOKIE ILLINOIS

THIS IS FOAMGLAS®

PIPE INSULATION

The only pipe insulation made of cellular glass, it is factory fabricated to insure close fit with equipment and full thickness of insulation. FOAMGLAS pipe and fitting insulation is being used successfully on hot and cold lines, indoors and out, without expensive vapor, moisture, or weather protection. Pipe insulation is available in two types, "Regular," or plain, and "Factory-wrapped" that has a glass cloth membrane to serve as a utility finish where insulation needs protection from extreme impact and abrasion.

There is no other insulation like it—Here's why:

FOAMGLAS is not a fiber, a batt, a blanket, wool or board. It contains no granular or organic material. It is composed entirely of still air sealed in millions of minute glass cells.

FOAMGLAS eliminates the need for extra moisture and vapor barriers. It is practically impervious to fumes, chemicals and many other elements, therefore *retains* its original insulating efficiency throughout exceptionally long service.

FOAMGLAS is an effective barrier to heat flow. It helps maintain predetermined temperatures when installed on roofs and ceilings, in walls and under floors. It is being used successfully in many and varied high and low temperature applications on pipe lines.

FOAMGLAS is light, strong, rigid, durable. It cannot burn. Insects and vermin cannot nest in it, eat into or through it. FOAMGLAS needs no special type weatherproofing when used outdoors.

PITTSBURGH PC CORNING ®

Pittsburgh Corning Corporation
Dept. AF-42, 307 Fourth Avenue, Pittsburgh 22, Pa.

Please send me without obligation a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

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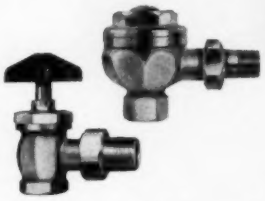
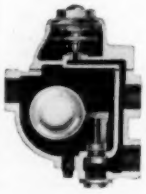
PITTSBURGH CORNING CORPORATION · PITTSBURGH 22, PA.

Marsh Again!

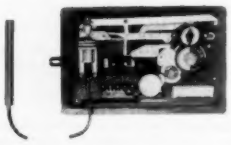
John Moses Veterans Hospital, Minot, North Dakota.
Corps of Engineers were the engineers; Carlson Duluth Company, Mechanical contractors.



The Marsh Radiator Valve is packless, not just in name but in service . . . year after year. Best team-mate for it is the time-proved, trouble-free Marsh Trap. This combination was used throughout the John Moses Veterans Hospital.



You can depend on the wide line of Marsh float and thermostatic traps. Thousands are proving this in daily service.



The simple, low-cost, easy-to-install regulator for all multiple-occupancy buildings. By keeping inside heat in step with outside weather it assures ideal comfort at minimum fuel cost.

Marsh Valves and Traps Chosen for another Big Heating System

This impressive building is the recently completed John Moses Veterans Hospital at Minot, North Dakota. It is another significant addition to the long list of big, well-constructed buildings equipped throughout with Marsh Valves and Traps.

The selection of valves and traps for buildings of this size calls for utmost caution. That is why we keep pointing out the ever-recurring selection of Marsh equipment for larger buildings. It is your best proof that Marsh is at the top of the list for the most exacting jobs in every part of the country.

And what job isn't exacting? For your next one use the radiator valve with the metal-to-metal seal — the valve that is truly packless. Team it up with that masterpiece of precision — the Marsh Radiator Trap. You will then know how dependable and trouble-free a valve and trap can be.

Ask for Catalog 76-H covering the full line of Marsh Heating Specialties

MARSH HEATING EQUIPMENT CO.

Sales Affiliate of Jas. P. Marsh Corporation

Dept. T., Skokie, Ill.

MARSH

Quality Heating Specialties **SINCE 1865**

This house sells air conditioning

This is a Carrier Weathermaker Home. It is built to take advantage of air conditioning. It gives the buyer better living. It can sell for you.

The architects—Carroll, Grisdale & Van Alen is a well-known Philadelphia firm whose recent work includes the Youth Study Center on Benjamin Franklin Parkway and the Terminal Building, Philadelphia International Airport (now in progress).

The Carrier Weathermaker

is designed for a duct system like that used for forced warm air heating. The Weathermaker cools and heats. It burns gas for heating . . . uses a sealed electric refrigerating unit for cooling. It is only a little larger than an ordinary furnace.

better value

When you sell the new Carrier Weathermaker Air Conditioner, you can give your buyer the advantages of a Weathermaker Home. You can give him more usable space per building dollar because in a Weathermaker Home rooms need only one exposure. Windows aren't needed on every wall. Movable sash isn't required. The floor plan can be a simple rectangle.

lower price

When you sell the new Carrier Weathermaker Air Conditioner for a Weathermaker Home, you can give the buyer a better price . . . and you can assure him of lower operating costs. The buyer won't need as much air conditioning capacity — because he can set and forget his air conditioning. And the Weathermaker Home is designed to reduce the heat load — and operating costs.

more profits

When you sell the new Carrier Weathermaker Air Conditioner for a Weathermaker Home, you're selling an exclusive. And you're selling an exclusive that gives the buyer extra benefits. You can demonstrate that he can have a better home. You can demonstrate his money savings. Isn't that the kind of deal that you'd like to be in on? Then write today!

Carrier

AIR CONDITIONING • REFRIGERATION

For 50 years—the people who know air conditioning best

CARRIER CORPORATION
305 South Geddes Street, Syracuse, N. Y.

Please send me the profit story on the Weathermaker Air Conditioner and the Weathermaker Home.

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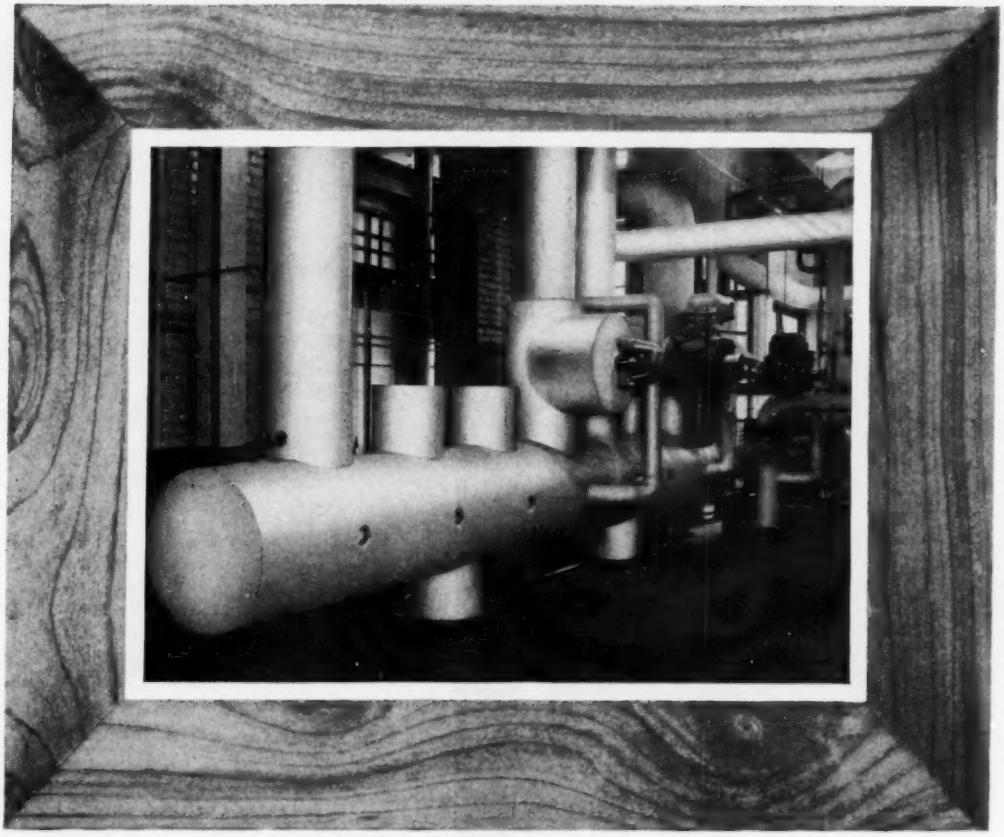


Insulation Contractor: Guy M. Beaty & Co., Charlotte, N.C.

Steam header at Cannon Mills Co., Kannapolis, N.C., insulated with K&M Hy-Temp and "Featherweight" 85% Magnesia Combination, finished with sewed canvas jacket.

PORTRAIT OF STEAM HEADER AT 750° F.

clothed for life . . . . with K&M Insulations

YOU SEE here one of the most efficient combinations you can get today for lifetime protection against heat loss—K&M Hy-Temp Insulation teamed up with "Featherweight" 85% Magnesia.

You can use the same combination, in appropriate thicknesses, for efficient insulation of temperatures from 600° F. up to 1900° F.

K&M Hy-Temp Insulation is applied directly to the high temperature surface in sufficient thickness to lower the temperature of the outer surface of the insulation to 600° F. or less. "Featherweight" 85% Magnesia, which has a higher insulating value, is then applied directly over the Hy-Temp Insulation, thus utilizing the advantages of both insulations to the fullest extent.

These insulations are supplied in appropriate forms and thicknesses for application to equipment surfaces and piping.

Your local K&M distributor, who is an experienced applicator, will give you full information. Or write us direct . . . we'll rush a reply.

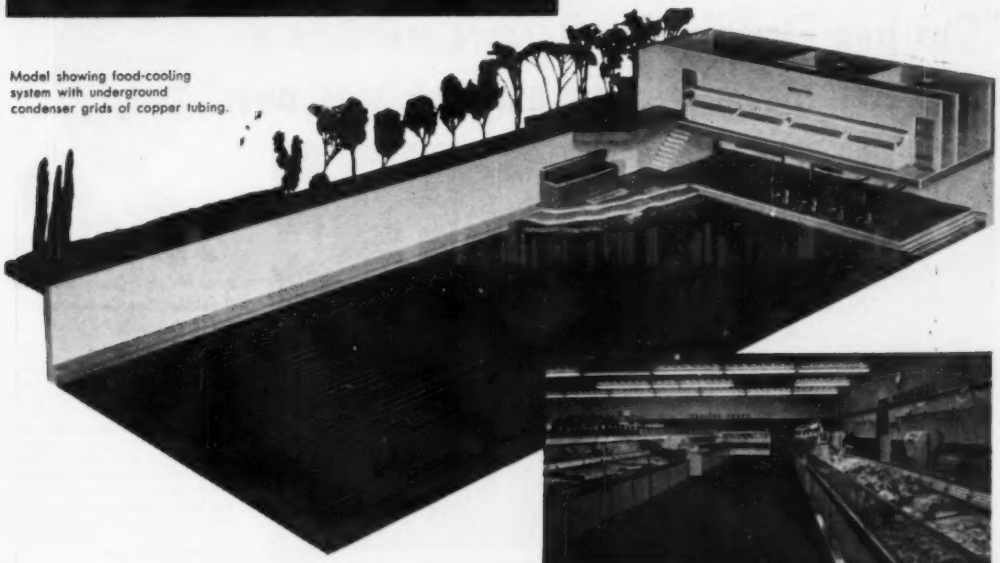
Nature made Asbestos . . .

Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON

COMPANY • AMBLER • PENNSYLVANIA

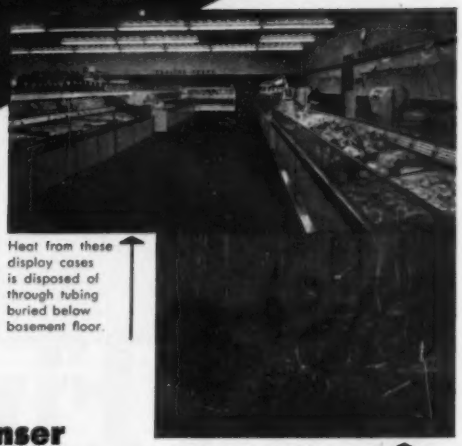
FACTS ABOUT COPPER'S ECONOMY



Model showing food-cooling system with underground condenser grids of copper tubing.

copper tubes

form underground refrigeration condenser



Heat from these display cases is disposed of through tubing buried below basement floor.

Installing condenser grid in wet clay prior to pouring basement floor.

When discussing the refrigeration system of a planned new supermarket, the owner stipulated:

1–Low operating costs

2–Minimum use of city water

3–Dry basement storage facilities

The Charlton brothers of the Temperature Equipment Company, Hartford, met all 3 requirements very successfully and to the owner's complete satisfaction.

The system was devised so that earth instead of water is used as the cooling medium. Copper tube grids, installed in the ground before the concrete basement floor was poured, serve as the condenser. The surrounding damp earth efficiently absorbs the heat and enough warmth reaches the basement floor to prevent the accumulation of moisture on its surface.

In the first year of operation the owner estimates a saving of $750 in water charges alone, plus the added savings afforded by the dry basement in eliminating moisture damage to stored goods. It's another example of the versatility of ANACONDA Copper Tubes for all types of plumbing, heating and refrigeration piping.

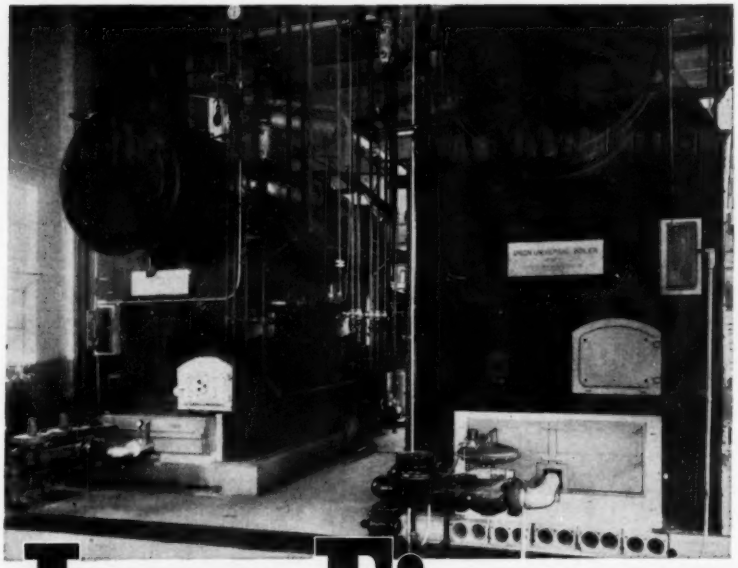
A complete description of this installation will be gladly forwarded on request. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

modern plumbing calls for ANACONDA® copper tubes

"Our Iron Fireman Gas Burners maintain a more even steam pressure and save manpower"

says Mr. O. Carlyle Brock
President, Sanida Sanitary Farms Dairy, Inc.
Erie, Pennsylvania

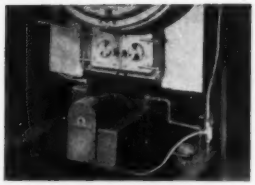
"Our original boilers were coal fired, and since changing to your gas burners, we can maintain a more even steam pressure and are experiencing considerable savings in manpower. Our load changes quite rapidly and at no time have we been held up for lack of steam. We are also able to maintain a clean boiler room which is quite important in dairy operations."



Both boilers at Sanida Dairy (100 h.p. and 150 h.p.) are fired by Iron Fireman GCV vertical-type Gas Burners. Zone fire control permits low-fire start and self-adjusting modulated firing. Automatic damper controls enable rapid heat response.

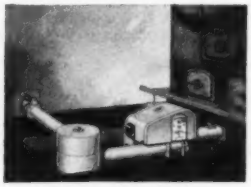
Iron Fireman Gas Firing for heating, power, or processing

Iron Fireman gas firing is saving users many fuel dollars. "Control" is the answer—control of the fuel-air ratio for the most efficient combustion; *control* of the firing rate to instantly adjust to the load; and *control* to compensate for varying pressures in the gas supply. No other gas firing gives such outstanding performance and savings. They are available in three styles—inshot burners, vertical-type burners, and ring-type burners, for boilers up to 1,000 horsepower. Find out how much an Iron Fireman can save for YOU. Phone your nearest dealer or send the coupon below for descriptive literature.



Horizontal Rotary Oil Burner

Fires low-cost, heat-rich heavy oils (Nos. 5 and 6) with complete steadiness and dependability. Oil feed rate is constant, even with changes in viscosity of oil.



Coal-Flow Stoker

Feeds coal direct from bin. No coal handling. Synchronized coal and air supply automatically adjusted to boiler load at all times. Capacities to 400 boiler h.p. Pneumatic Spreader models also available.

MAIL COUPON FOR FULL INFORMATION

IRON FIREMAN MFG. CO. 3272 W. 106th Street, Cleveland 11, Ohio.
Please send literature as checked:

- ☐ Commercial Gas Burners
- ☐ Coal-Flow Stokers
- ☐ Rotary Oil Burners
- ☐ Pneumatic Spreader Stokers

Name_____
Address_____
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AUTOMATIC FIRING FOR HOMES, BUILDINGS, INDUSTRIAL PLANTS

The When, Where, Why and How of Silver Alloy Brazing—

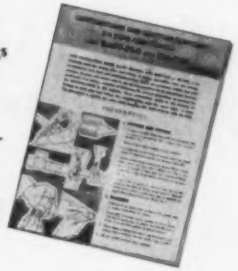
If you're in any way interested in metal joining, you'll find a lot of useful information and data on the subject in the free printed matter below. Copies of one or all are yours for the asking. Write for them today.

BULLETIN 20

This 24-page bulletin is a "must" for every design and production engineer. It gives full details about EASY-FLO and SIL-FOS—what the alloys are—what they do—how to use them—also a lot of valuable information on joint design, heating methods and fast production procedures. You'll find plenty of meat in the illustrations, too.

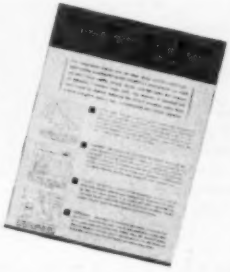
BULLETIN 17

This bulletin gives complete instructions for brazing fittings to pipe and tubing with EASY-FLO and SIL-FOS. It tells—how to cut and fit pipe and tubing—how to clean and flux surfaces to be joined—how to support assemblies—how to heat—how to clean after brazing. It covers the making of vertical up, vertical down and horizontal joints.



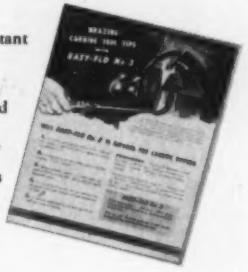
TORCH BRAZING INSTRUCTIONS

This bulletin gives full instructions for EASY-FLO and SIL-FOS alloy brazing with gas torches—including fit of joint—cleaning—fluxing—assembling—heating—applying the alloy—flux removal after brazing. Ask for the Torch Brazing Instruction Bulletin.



BULLETIN 11-A

This bulletin covers an important item in metal working shops today—the mounting of cemented carbide tool tips with EASY-FLO No. 3 on lathe and milling cutters and other carbide tipped tools and parts. It explains why EASY-FLO No. 3 is recommended for this work by leading carbide tip manufacturers and covers the procedure step-by-step for various heating methods.



BULLETIN 14

This bulletin covers the repair of broken broaches, drills, taps, band saws, circular saws, form cutters and milling cutters of all kinds with EASY-FLO. It explains how, with a few cents' worth of EASY-FLO, valuable tools can be put back in service in a jiffy at a fraction of the cost of replacement.

TECHNICAL BULLETINS

These bulletins are published periodically. They contain factual technical data and new information about low-temperature silver alloy brazing as uncovered through the Research that is carried on continually in our laboratories. If you would like to receive these bulletins as published, write and ask us to add your name to the Technical Bulletin mailing list.

HANDY & HARMAN — FOUNDED 1867 — QUALITY SERVICE — ORIGINATORS OF EASY-FLO & SIL-FOS

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General Offices: 82 Fulton St., New York 38, N.Y.

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. . . Digging for facts

ON AUTOMATIC REGULATING VALVES?

YOU'LL FIND THESE KLIPFEL BULLETINS PRACTICAL, FACTUAL AND USEFUL!

Klipfel engineers have put a lot of experience and research into these bulletins to make them useful to you . . . the man who uses or specifies automatic regulating valves. Each bulletin covers such points as: the advantages and limitations of different valve constructions; selecting the proper type valve for given operating conditions; determining the most effective and economic size valve for the job.

In short, Klipfel engineers have prepared these bulletins to assist you in selecting the type and size valve best suited to your needs.

Write Dept. C-9 for any bulletins you wish. We'll gladly send them to you.

KLIPFEL REDUCING VALVES
for steam, air and water . . . in lever and weight, air loaded, pilot control and spring loaded types; descriptions, illustrations and complete selection data in Bulletin 148.

KLIPFEL FLOAT VALVES
Single and double seated types with direct action or pilot control for remote location. Types shown include quick-acting valves; all are available in angle and globe patterns. Bulletin 349.

KLIPFEL THERMOSTATIC VALVES
vapor pressure operated valves with spring or weight and lever loading. Valves are ball type, balanced cup and disc or balanced inner valves. Min. temp. 80°. Max. temp. 250°. Range limit of any instrument 40°. Full Data in Bulletin 449.

KLIPFEL BACK PRESSURE AND RELIEF VALVES
for control of air, steam and water pressures at the valve inlet in various types for practically any service. Bulletin 648 gives complete details including dimensions and capacities.

Klipfel VALVES INCORPORATED

DIVISION OF HAMILTON - THOMAS CORPORATION, HAMILTON, OHIO

ALADDIN *Presents*

A NEW COMPLETE LINE OF CENTRIFUGAL FANS

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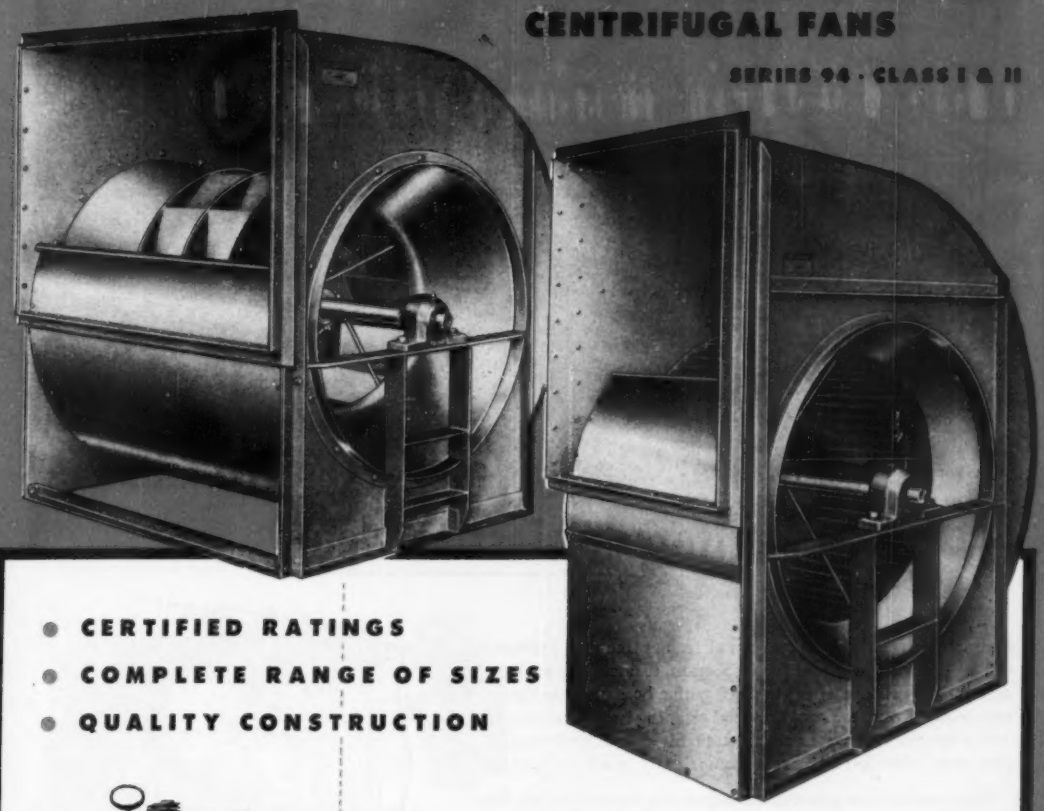


- CERTIFIED RATINGS
- COMPLETE RANGE OF SIZES
- QUALITY CONSTRUCTION

DESIGN FEATURES

1. High "over all" efficiency
2. Low rotational speeds
3. Minimum outlet velocities
4. Low noise level
5. Quality construction throughout

CERTIFIED RATINGS
AUTHORIZED BY
NAFM

THE BLOWER DIVISION of Aladdin Heating Corporation presents an entirely new and more complete line of centrifugal fans. Furnished in two classes of construction and in all arrangements—both single and double width—the new Series 94 Fans are available in twenty-two sizes of both backwardly inclined and forward curved types.

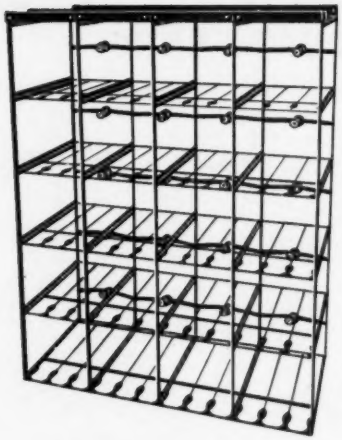
EACH FAN ***is rated in accordance with the standard test code for centrifugal fans approved jointly by NAFM and ASH&VE***

ALADDIN HEATING CORPORATION

GENERAL OFFICES AND FACTORY: 2272 SAN PABLO AVENUE · OAKLAND 12, CALIFORNIA

Representatives in all Principal Cities in the West

"Building block" installation makes Electromaze filters easiest to install



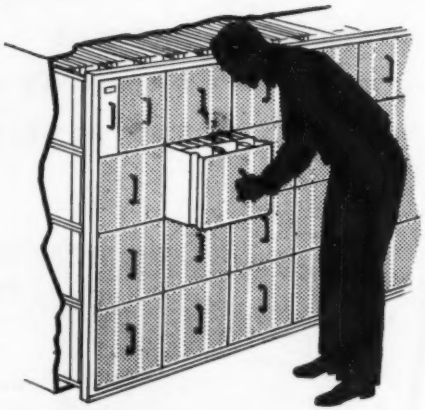
Contractors report that Electromaze precipitators require 50% less time and effort to install than other electronic filter systems.

Electromaze filter banks can be erected faster and more economically because the cellular steel holding frames come in prefabricated sections. All you have to do is bolt them together to form banks built like a skyscraper. Light, easy-to-handle Electromaze Uni-Cells slide into the holding frames to complete the bank. Cells come in three sizes—can be combined to meet almost any space or capacity requirement.

"Desk drawer" design makes Electromaze filters easiest to clean

Electromaze cells slide in and out of frames like desk drawers, can be instantly removed for inspection, servicing or replacement. They can be cleaned in place with a hose under ordinary city water pressure. Should manual cleaning become necessary —as it may in all types of electrostatic filters—removal is quick and easy, electrical contact automatically made or broken.

Electromaze precipitators are supplying super-clean air for hundreds of offices, stores, hospitals, factories, bowling alleys and other commercial and industrial applications. Get expert help in solving your air filtering problem from your nearby Air-Maze representative, or write Air-Maze Corporation, 5200 Harvard Avenue, Cleveland 5, Ohio.



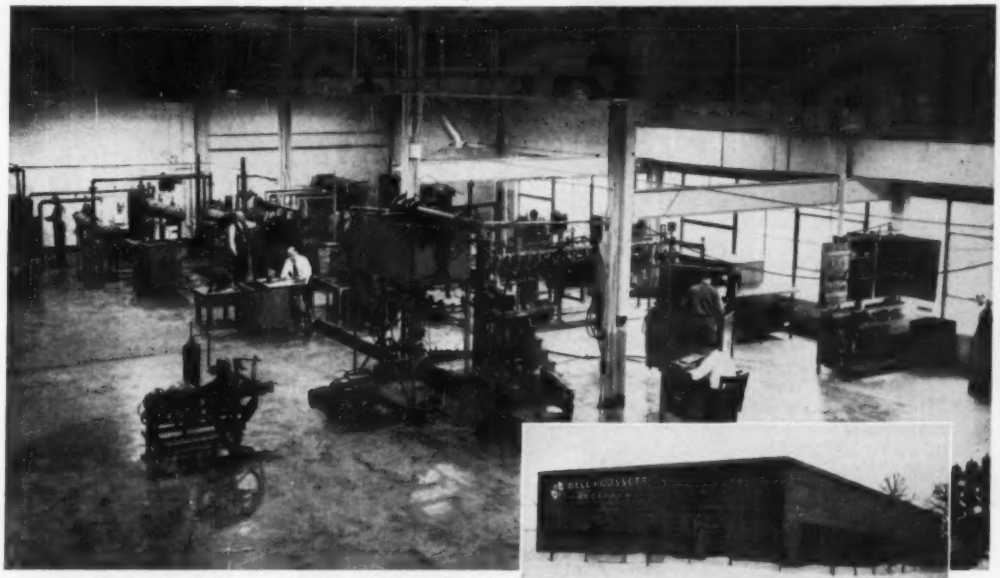
The biggest names in diesels are protected by Air-Maze filters

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
THE FILTER ENGINEERS

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

WHERE *Research* WORKS FOR YOU



A section of the B & G Laboratory showing equipment under test.

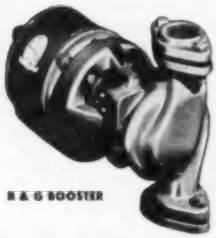
The B & G Research Laboratory at Morton Grove, Illinois.

B & G WATER HEATER

B & G MONOFLO FITTING

B & G RELIEF VALVE

B & G FLO-CONTROL VALVE

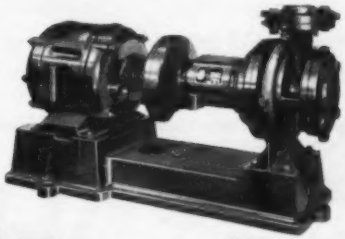


B & G BOOSTER

- In this building, a continuous program of research and experimentation is devoted to the interests of better heating.

Complete modern facilities are available for extensive product development and the exploration of new ideas. Laboratory technicians, working in conjunction with the engineering staff analyze problems and needs reported from the field and work out practical solutions. Test equipment permits duplication of actual operating conditions.

This never-ending effort to improve both product and methods of application is the reason you can specify B & G *Hydro-Flo* Heating Equipment with full confidence in its quality and dependability.



B & G UNIVERSAL PUMP

B & G *Hydro-Flo* PRODUCTS

A complete line of forced hot water heating system equipment for residential, commercial and industrial application. Look for the B & G emblem—it is your warranty of satisfaction.

*Reg. U. S. Pat. Off.

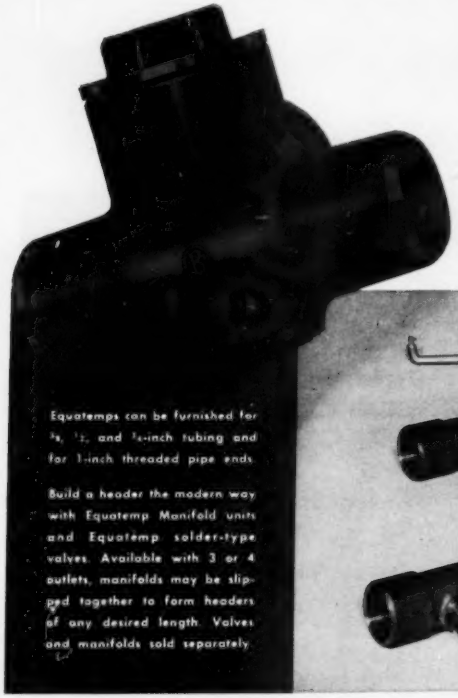
BELL & GOSSETT
COMPANY

Dept. CLS, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto, Canada

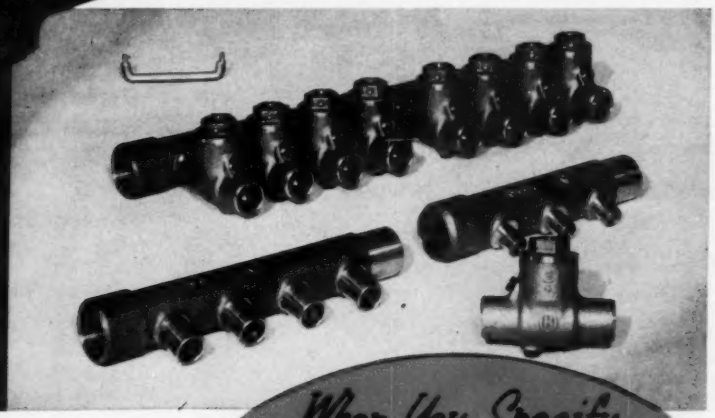
Balancing is easier ...

AND COSTS LESS



Equatemps can be furnished for ⅜, ½, and ¾-inch tubing and for 1-inch threaded pipe ends.

Build a header the modern way with Equatemp Manifold units and Equatemp solder-type valves. Available with 3 or 4 outlets, manifolds may be slipped together to form headers of any desired length. Valves and manifolds sold separately.



When You Specify

EQUA = TEMP

RADIANT HEAT VALVES

Save the cost of extra valves and extra fittings by specifying O-B Equatemps on your next radiant job. These versatile new valves do the whole job—balancing, venting, and draining. Best of all, Equatemps can be shut off leaktight on individual lines. A well drilled in the valve stem, permits flow to be balanced by thermometer method. Once proper balancing has been achieved, settings can be locked to prevent tampering by the "home plumber."

For additional information about Equatemps, contact your local O-B valve distributor or send in coupon below requesting illustrated folder.

EASY TO REGULATE - EASY TO INSTALL

Equatemps are ideal for all types of hot water radiant heating systems—floors, ceilings, panels, convectors, or baseboard systems.

Try them in—

- **Homes**
- **Apartments**
- **Hotels**
- **Hatcheries and Farm Buildings**
- **Motor Courts**
- **Snow Melting**

Please send me Equatemp folder 1214-V

Name .....

Company .....

Street .....

City ..... **State** .....

Ohio Brass

MANSFIELD • OHIO

4208-V

THERE'S A STAYNEW VENTILATION PANEL FILTER

FOR EVERY TYPE OF COMMERCIAL AND INDUSTRIAL SERVICE

Ventilation and air conditioning engineers recognize the Model WKE dry-panel filter as the most efficient unit of its kind on the market today. Wide range of media is available — it operates at maximum efficiency with any medium that comes in sheet form and can be crimped. Because of its extreme versatility, the Staynew WKE filter may be used for hundreds of varied applications.

- Greater filtering area, size for size, than competitive panels.
- Construction permits wide selection of filtering media.
- Wire screen cloth front and back of medium eliminates "sagging" and protects it so that even the most fragile materials can be cleaned over and over again.
- Can be cleaned quicker than any other type panel.
- Can be washed or dry cleaned when necessary.
- Medium can be replaced quicker than in any other panel.

Inexpensive disposable media can be furnished, if desired.

MODEL WKE Dry Panel Filter Available in 2", 4", and 8" Deep Units

One exclusive advantage with the Staynew WKE is that it can be easily vacuum-cleaned in place. Saves time—reduces maintenance costs.

For complete information write today for Bulletin DPF-100.

Representatives in Principal Cities

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

9 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

Represented by people you know . . .

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Albany, New York, F. R. Foote Co., Inc.
Albuquerque, N. M., Boyd Engineering Co., Inc.
Amarillo, Texas, Snook & Aderton, Inc.
Atlanta, Georgia, Crawley-Garbant Co.
Baltimore, Md., Lancaster, May & Co.
Billings, Mont., Sullivan Valve & Engr. Co.
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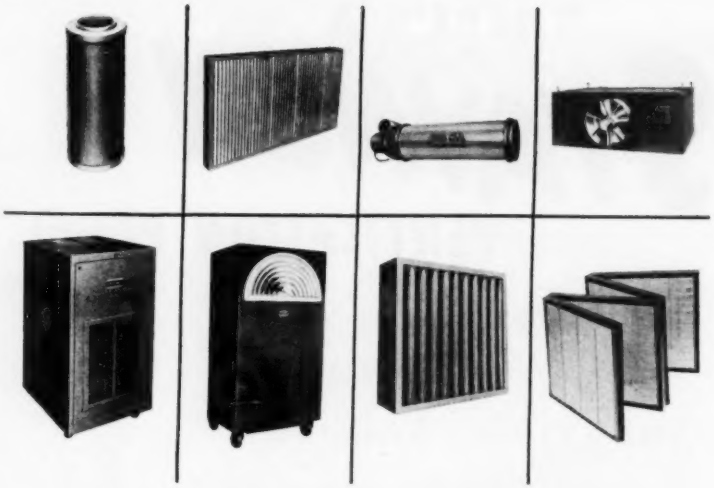
West Hartford, Conn., Augur, Jones & Green
Wichita, Kansas, J. M. O'Connor Co.



Purify air and remove odors with *Pur Air* activated, coconut-shell carbon

Where odor removal is a problem, Pur Air equipment can supply the answer . . . in duct systems, with fixed-mount installations or portable units. 35 years of testing over 15,000 materials proved that activated carbon made from coconut shells had the greatest adsorptive qualities for air purification. In Pur Air equipment you get ONLY true Activated, Coconut-shell Carbon . . . no substitutes. The carbon does the job, and in Pur Air equipment you get plenty of ACSC*. Quality control is assured, because Pur Air is the only manufacturer that both produces activated, coconut-shell carbon and builds the equipment, too.

Pur Air equipment for all applications

For air intake and air recirculation ducts the adsorber plates, filter fold, partial-air-by-pass or canisters are used. Portable units are used in conference rooms, hospital wards, etc. . . . fixed mount in industrial areas and cold storages. The Fresh'ner is ideal for small rest rooms and dressing rooms.

For detailed information phone our nearest office (listed at left) or write direct.

*ACSC: activated, coconut-shell carbon.

Pur Air

a division of **AMERICAN SOLVENT RECOVERY CORP.**

COLUMBUS 3, OHIO

WORLD'S LARGEST PRODUCER OF GAS-ADSORBENT CARBONS

ANOTHER EXAMPLE OF VERSATILITY..

DRAVO *Counterflo* HEATERS*

SERVE BUFFALO TRANSIT COMPANY IN 3-WAYS

*DIRECT-FIRED

COMFORT HEATING—in winter. Four Dravo Heaters recirculate warm air over a 33,600 sq. ft. floor area in three integrated buildings . . . each heater has maximum air throw . . . provides uniform heat for personnel at working levels, despite opening and closing of doors to permit buses to enter and leave.

VENTILATING—in summer. Heater fans can be used alone to recirculate air and keep working conditions comfortable in hot weather. The Dravo Heaters are mounted horizontally and suspended from roof trusses to save valuable floor space.

DRYING—all year 'round. One heater, in addition to these other functions, dries buses with warm air as they come off the wash rack.

DRAVO HEATERS OFFER YOU...

- **Low initial cost**—users report savings of 30% to 60% over standard "wet-type" systems.
- **Easy installation**—no duct work . . . need only fuel, exhaust and electrical connections.
- **Low operating cost**—burns gas or oil . . . easily converted . . . minimum efficiency 80%.
- **Long life—low maintenance**—rugged construction . . . stainless steel combustion chamber eliminates refractory lining.
- **Heat where you need it**—right in the working zone . . . roof heat losses reduced.
- **Automatic operation**—heater looks after itself . . . requires only occasional attention.

MAIL THIS COUPON FOR MORE INFORMATION...

Heating Department, Dravo Corporation
Dravo Building, Fifth and Liberty Avenues
Pittsburgh 22, Penna.

I would like more information about Dravo Counterflo Heaters. Please send me Bulletin No. UV-523-2435.

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

DRAVO

CORPORATION

PITTSBURGH • ATLANTA • BOSTON • CHICAGO • CLEVELAND
DETROIT • NEW YORK • PHILADELPHIA

Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec. Export Associates: Lynch, Wilde & Co., Washington 9, D.C.

JENKINS PRACTICAL PIPING LAYOUTS

59

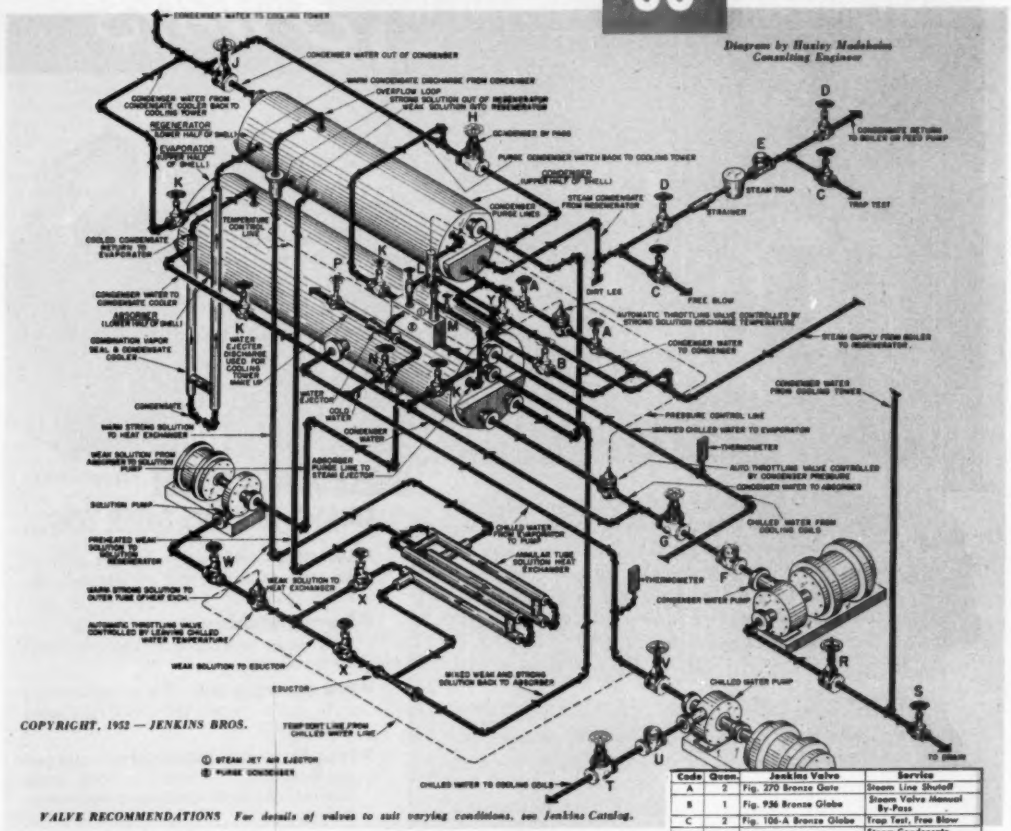


Diagram by Hussey Madeheim
Consulting Engineer
CONDENSER WATER TO COOLING TOWER
CONDENSER WATER OUT OF CONDENSER
WARM CONDENSATE DISCHARGE FROM CONDENSER
OVERFLOW LOOP
STRONG SOLUTION OUT OF REGENERATOR
WEAK SOLUTION INTO REGENERATOR
CONDENSER WATER FROM CONDENSATE COOLER BACK TO COOLING TOWER
REGENERATOR (LOWER HALF OF SHELL)
EVAPORATOR (UPPER HALF OF SHELL)
CONDENSER (UPPER HALF OF SHELL)
PURGE CONDENSER WATER BACK TO COOLING TOWER
CONDENSATE RETURN TO BOILER OR FEED PUMP
STEAM TRAP
STRAINER
TRAP TEST
STEAM CONDENSATE FROM REGENERATOR
CONDENSER PURGE LINES
DIRT LEG
FREE BLOW
COOLED CONDENSATE RETURN TO EVAPORATOR
CONDENSER WATER TO CONDENSATE COOLER
ABSORBER (LOWER HALF OF SHELL)
COMBINATION VAPOR SEAL & CONDENSATE COOLER
WATER EJECTOR DISCHARGING USED FOR COOLING TOWER MAKE UP
AUTOMATIC THROTTLING VALVE CONTROLLED BY STRONG SOLUTION DISCHARGE TEMPERATURE
CONDENSER WATER TO CONDENSER
STEAM SUPPLY FROM BOILER TO REGENERATOR
CONDENSER WATER FROM COOLING TOWER
PRESSURE CONTROL LINE
CHILLED CHILLED WATER TO EVAPORATOR
THERMOMETER
AUTO THROTTLING VALVE CONTROLLED BY CONDENSER PRESSURE
CONDENSER WATER TO ABSORBER
CONDENSATE
WARM STRONG SOLUTION TO HEAT EXCHANGER
WEAK SOLUTION FROM ABSORBER TO SOLUTION PUMP
ABSORBER PURGE LINE TO STEAM EJECTOR
SOLUTION PUMP
PREHEATED WEAK SOLUTION TO REGENERATOR
COOLED WATER FROM CONDENSER TO ABSORBER
ANNULAR TUBE SOLUTION HEAT EXCHANGER
CHILLED WATER FROM COOLING COILS
THERMOMETER
CONDENSER WATER PUMP
WEAK SOLUTION TO HEAT EXCHANGER
STRONG SOLUTION TO OUTER TUBE OF HEAT EXCH.
AUTOMATIC THROTTLING VALVE CONTROLLED BY LEAVING CHILLED WATER TEMPERATURE
WEAK SOLUTION TO EDUCTOR
EDUCTOR
MIXED WEAK AND STRONG SOLUTION BACK TO ABSORBER
CHILLED WATER PUMP
TO DRAIN
TEMP. DIFF. LINE FROM CHILLED WATER LINE
CHILLED WATER TO COOLING COILS
STEAM JET AIR EJECTOR
PURGE CONDENSER

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VALVE RECOMMENDATIONS For details of valves to suit varying conditions, see Jenkins Catalog.

Code	Quan.	Jenkins Valve	Service
A	2	Fig. 270 Bronze Gate	Steam Line Shutoff
B	1	Fig. 936 Bronze Globe	Steam Valve Manual By-Pass
C	2	Fig. 106-A Bronze Globe	Trap Test, Free Blow
D	2	Fig. 270 Bronze Gate	Steam Condensate Shut-off
E	1	Fig. 762 Br. Swing Check	Prevent Condensate Backflow
F	1	Fig. 624 I.B.B.M. Sw. Check	Condenser Pump Discharge
G	1	Fig. 142 I.B.B.M. Globe	Condenser Pump Discharge
H	1	Fig. 142 I.B.B.M. Globe	Condenser By-Pass
J	1	Fig. 651, I.B.B.M. Gate	Condenser Discharge Shutoff
K	4	Fig. 106-A Bronze Globe	Condenser Water
L	1	Fig. 744-G, Bronze Needle	Condenser Purge Line
M	1	Fig. 743-G, Bronze Needle	Absorber Purge Line
N	1	Fig. 106-A Bronze Globe	City Water to Water Ejector
P	1	Fig. 47-U, Bronze Gate	Water Ejector Discharge
R	1	Fig. 651, I.B.B.M. Gate	Condenser Pump Suction
S	1	Fig. 106-A Bronze Globe	Condenser Water Drain Valve
T	1	Fig. 142 I.B.B.M. Globe	Chilled Water Pump Discharge
U	1	Fig. 624, I.B.B.M. Sw. Check	Chilled Water Pump Discharge
V	1	Fig. 651, I.B.B.M. Gate	Chilled Water Pump Suction
W	1	Fig. 75-A All Iron Globe	Solution Flow Control
X	2	Fig. 75-A All Iron Globe	Solution Flow Control
Y	1	Fig. 936, Bronze Globe	Steam Ejector Shutoff

How to plan ABSORPTION REFRIGERATION CONNECTIONS FOR AIR CONDITIONING

Absorption refrigeration systems for air conditioning generally use water as the refrigerant and a water absorbent salt solution which dissolves the vapor from the chilled water in the evaporator, with a very low pressure and temperature resulting. The chilled water is then pumped through coils of the air handling units.

The diluted salt solution is withdrawn from the absorber. A portion is pumped to an eductor, the remainder to the solution regenerated through an annular tube heat exchanger. In the regenerator, the weak solution is heated by a steam coil to boil off the water vapor dissolved in the absorber. This strengthened solution then returns to the absorber through the heat exchanger and eductor.

The steam boiled off the weak solution is condensed and returned to the evaporator pan through the vapor seal loop. Tandem steam and water jets maintain low pressure in both shells. Cold water from the water jet is used for makeup in the cooling tower.

Consultation with piping engineers is recommended when planning any major piping installations.

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering, select all the valves you need from Jenkins complete line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17; Jenkins Bros., Ltd., Montreal.

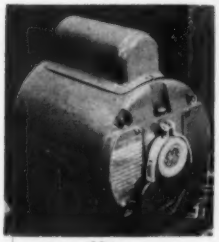
COMPLETE DESCRIPTION AND ENLARGED DIAGRAM OF THIS LAYOUT FREE ON REQUEST. Includes additional detailed information. Ask for Piping Layout No. 59.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
MADE BY JENKINS
Jenkins Bros.

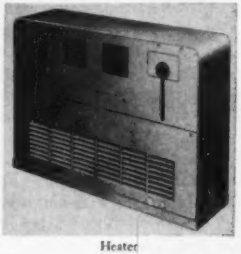
EQUIPMENT DEVELOPMENTS...

Lightweight Fractional Horsepower Motors

HPAC 1—"Form G" fractional horsepower motors, weighing as much as 51 percent less per horsepower than the models they replace, and considerably smaller in size — General Electric Co., Schenectady 5, N. Y. They are available in open drip-proof and totally enclosed fan cooled models in polyphase, capacitor start, split phase and split capacitor types. They have a variety of applications on pumps, fans, blowers, compressors, etc. A new insulation system has been used, consisting of a special nylon material combined with the company's wire and varnish. Also featured are new bearings, lubrication system, mountings, windings, end shields, terminal board, and leads. The motors are engineered for dissipation of heat losses, and, being smaller and lighter, permit installation of maximum power in minimum space, the company states. These general purpose sleeve bearing motors are recommended for all-angle operation, and conform fully to NEMA specifications. They will be offered in a complete range of standard horsepowers, speeds, voltages and frequencies.



Motor



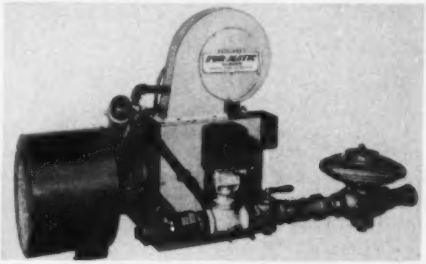
Heater

Unit Heater

HPAC 2*—"De Luxe" unit heater with front outlet, for use in churches, offices, lobbies, etc.—Herman Nelson Div., American Air Filter Co., Inc., Moline, Ill. The unit, which can be recessed into walls, incorporates a coil for either steam or hot water applications. The coil is positioned so that piping can be brought in from either side of the unit. There is an adjustable pitch motor sheave for varying cfm requirements.

Combination Gas-Oil Burner

HPAC 3—"Fyr-Matic" gas-oil burner, designed for industrial and commercial use where both oil and gas are available — Eclipse Fuel Engineering Co., 1139 Buchanan St., Rockford, Ill. Changeover from one fuel to the other, effected by means of a snap switch, is automatic and instantaneous, the company states. There is dual atomization, intended to make the use of oil or gas equally efficient. Also included are built-in tuyere, engineered to complete the rotary combustion principle, adjustable burner support, and electronic flame failure control. All internal wiring and piping are supplied. Mixed, natural or L-P gas (800 to 3200 Btu) or No. 1, 2, or 3 fuel oil may be used. Either gas or oil can be burned without induced secondary air. Applications include steam boilers, water heaters, air heaters, etc.



Constant Support Hanger

HPAC 4—Constant support hanger designed for supporting piping and equipment subject to large vertical

For your convenience in obtaining more information about any of this equipment, use this coupon. Add the new products and companies listed here to your Directory Section which you received in your January 1952 Heating, Piping & Air Conditioning, and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk, equipment and manufacturer not listed.

FOR YOUR CONVENIENCE (4-52)

Heating, Piping & Air Conditioning
N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature

(*Circle each HPAC number in which you are interested*)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40					
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115
116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140	141				

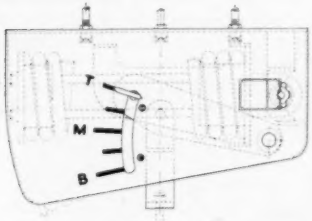
Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

movements, without introducing additional stresses into the piping system — Bergen Pipesupport Corp., 50 Church St., New York 7. It is constructed so as to permit normal longitudinal as well as transverse movement without impairing its efficiency. One compression spring is used and no compensating device is needed. Travel is indicated by a large pointer that has a full swing of approximately 7 in., irrespective of total travel. The pointer serves as a magnified direct reading indicator. The hanger is offered in 25 progressively graduated sizes ranging in travel from 2 to 12 in., and in load capacity from 50 to 8380 lb.



Above: Hanger
Right: Control

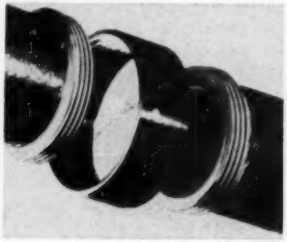
Control for Flooded Systems

HPAC 5*—"Level-Master" liquid level control device for flooded systems (ammonia, "Freon-12" and "Freon-22" applications) — Sporlan Valve Co. Inc., 7525 Sussex Ave., St. Louis 17. The instrument combines a liquid level control and refrigerant expansion device into one unit. It comprises a standard thermostatic expansion valve equipped with a new element consisting of a conventional thermostatic element and a low wattage heater. The heater provides an artificial superheat to the thermostatic charge. As the liquid level drops, the heater temperature increases the pressure in the thermostatic element, thereby opening the expansion valve which feeds refrigerant into the low side. When the liquid level rises and makes contact with the bulb, the refrigerating effect overcomes the heater and the valve throttles. Tight closing is provided during the off cycle, when the heater is off and liquid is in contact with the insert bulb.

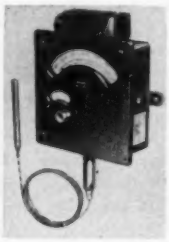
The control provides a modulated flow and maintains practically a static liquid level in the low side, the manufacturer states. The insert bulb has no moving parts and may be installed either vertically or horizontally. For installation, the insert bulb is placed directly in the shell, accumulator or liquid leg for direct contact with the refrigerant.

Joint for Ceramic Pipe

HPAC 6—"Screw-Seal" joint for ceramic pipe, for industrial use in conveying liquids and gases — The Robinson Clay Products Co., 65 W. State St., Akron 9. The joint is leakproof, infiltration proof, and resistant to 54 corrosive acids and to most noxious gases, including hydrocarbons, hydrogen sulphide, etc., the company states. It employs the matching thread principle. The clay pipe is made with a threaded joint composed of "Plastisol," a vinyl resin dispersed in a fluid material, which becomes rubber-like upon heating. Each clay pipe end is made dimensionally accurate in the application of plastic, which is cast directly on the pipe with the outer surface molded to a tapered thread. This provides two male-threaded ends. Pipe lengths are joined by means of a threaded pressure molded plastic collar with matching female threads. To assemble the joint, the collar is threaded over the stationary clay pipe end, and the pipe to be added to the line is turned into the collar by hand. The new pipe and joint is available in 4, 6 and 8 in. ID, with standard fittings.



Joint



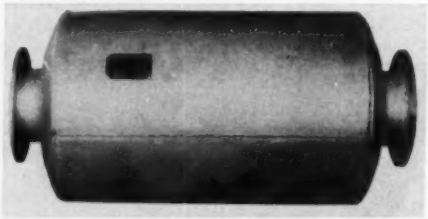
Thermostat

Adjustable Indicating Thermostat

HPAC 7—Type E8N remote bulb indicating thermostat for automatic temperature control of gases, liquids and hot plate applications — United Electric Controls Co., 85 School St., Watertown 72, Mass. It has calibrated temperature adjustment in Fahrenheit or Centigrade, and uniform on-off differential. Various models cover ranges of 300 or 600 F, between the limit of −150 to 600 F, with an approximate on-off differential approaching as low as 0.25 F, the company states. All models are head compensated to maintain the control point within 0.04 F, per degree F change in room temperature. This compensation is effective from −80 to 170 F. Full compensation is available for applications with ambient temperatures above or below this range. A liquid filled bellows, bulb and capillary assembly is used.

Silencing Equipment for Intake of Air Compressors

HPAC 8—Three "snubber" series developed to reduce air-borne air compressor intake noise, and to meet pulsation problems — Burgess-Manning Co., Libertyville, Ill. The equipment has been designed for use with any type



and size of compressor. Application recommendations are made by company engineers after consideration of the specific characteristics of each compressor. Applications include industrial locations, theaters, hospitals, etc.

Replaceable Type Filter

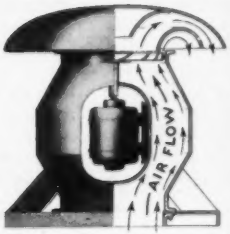
HPAC 9*—White replaceable type filter for forced air heating and cooling systems, in which glass filaments are packed so that dirt is trapped on the inside, rather than

Exit Fumes
FROM NEW INTERCHEMICAL PLANT

12 BIFURCATOR FANS

33 ROOF VENTILATORS

HOW THE BIFURCATOR FAN WORKS



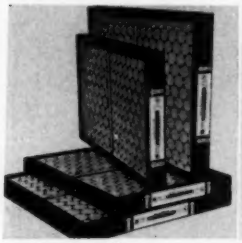
The DeBothezat Bifurcator is a direct motor-driven fan with a divided housing. Corrosive fumes are by-passed around the motor, which is mounted in a separate chamber, open to atmosphere but isolated from exhaust fumes. Bifurcator Roof Ventilators are equipped with weather-proof head and mounting base.

FREE CATALOG available on both DeBothezat Bifurcator Fans and Power-Flow Roof Ventilators. Ask your local DeBothezat agent or write the factory, Dept. HP-452.

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

the face, of the filter — American Radiator & Standard Sanitary Corp., P. O. Box 1226, Pittsburgh 30. The filaments are packed evenly across the air inlet side and then packed progressively tighter all the way to the air exit side. They are held in place with a thermoplastic bond, and sprayed with an adhesive intended to increase cleaning efficiency. The filter is held in a fiberboard casing between metal grilles. It is available in all standard sizes.



Filter

Burner

Oil Burner

HPAC 10 **—Model SA5 oil burner for large commercial and small industrial automatic heating installations — Anchor Div., Stratton & Terstegge Co., Inc., P. O. Box 311, New Albany, Ind. The burner features an adaptation of the "shell combustion head", which makes possible fuel oil savings of as much as 36 percent, the manufacturer states. Capacity range is from 5 to 10 gph of No. 2, or lighter, fuel oil. It measures 28¼ in. wide, 35½ in. deep. Height is adjustable from a minimum of 24 in. to standard 26¼ in., and shipping weight is 165 lb. It is equipped with a two-stage Sundstrand fuel unit, and cutoff is provided by a delayed action magnetic solenoid valve. The model is approved by Underwriters' Laboratories, Inc., and complies with U. S. Commercial Standard CS-75.

Flexible Hose

HPAC 11—"Flexaust" light weight, flexible hose made with neoprene compounds and laminated nylon chafer duck, for pressure and vacuum services — American Ventilating Hose Company, 100 Park Avenue, New York 17. This wire reinforced hose is intended for operations involving abrasive dust collection, heavy flexing and gravity feeds, etc. Sizes range from 1½ to 24 in. ID.

Above: Hose

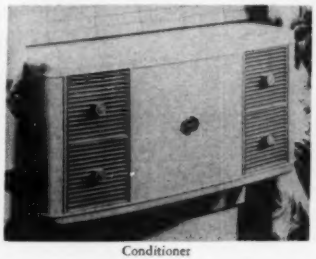
Right: Valve Assembly

Control Valve Assembly

HPAC 12—Throttling control valves which utilize pneumatic cylinder operators and the venturi type ball valves of the Paul Valve Corp. — Conoflow Corp., 2100 Arch Street, Philadelphia. The combination of these units, developed by collaboration of the two companies, is designed to simplify control problems involving corrosive fluids, abrasive materials, high temperature and high pressure applications. Since the "Cono-cylinder" operator utilizes a positioning mechanism as a component part, the assembly can be used with standard pneumatic control instruments for automatic control, or with manual loading stations for remote manual positioning. The venturi passages and the precision ground ball are intended to provide a non-turbulent flow stream eliminating cavitation, and to increase capacity. The venturi ball principle reduces unbalanced forces to unusually low values, so that the advantage of tight shut-off may be obtained without sacrificing control sensitivity, the manufacturer states. The valve is available in sizes to 8 in. and in a variety of body materials.

Window Type Room Air Conditioners

HPAC 13—1952 window sill type room air conditioners, with hermetically sealed refrigeration circuit, in two new models, 1/3 and 1 hp — York Corporation, Roosevelt Ave., York, Pa. The company has also refined five other room air conditioner models, two window type units, and three console type. The 1/3 hp window unit (shown) protrudes only 10 in. into the room, can be installed in almost any type window, and has four way adjustable air distribution grilles, the company states. The 1 hp window conditioner is designed to afford draft free circulation (it has adjustable rotary grilles), and features a large multiblade disk type fan.



Conditioner

Fan

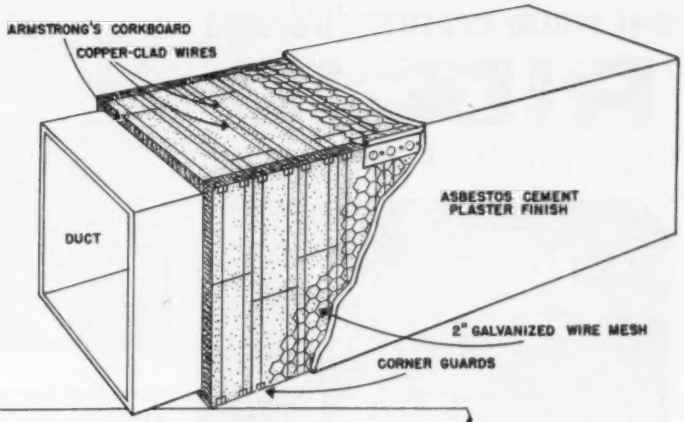
Power Line Duct Booster Fan

HPAC 14—Type PLDX heavy duty belt driven fan, with motor outside of air stream, for use in paint spray booths, large range hood exhausters, or ventilating or heating systems — Chelsea Fan & Blower Co., Inc., 639 South Ave., Plainfield, N. J. It is designed for moving air up to 350 F and for operation against moderate static pressure up to 2 in. Non-overloading, cast aluminum airfoil type propellers are used. Units are ball bearing, and motors are semi-enclosed or explosionproof, as required. The fans are available in sizes from 16 to 36 in., and in air deliveries from 2700 to 23,000 cfm.

Plastic Electrical Tape for Pipe Protection, etc.

HPAC 15—"Scotch" brand No. 21 heavy duty plastic electrical tape for anti-corrosion protection of pipes, cables, and equipment laid underground, where resistance to cuts and abrasions during backfill is important — Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6. It is also recommended by the manufacturer for protecting and insulating cable and high tension leads sub-

We have been asked:



How can we insulate air-conditioning ducts so they can be finished to match building interiors?

We recently received a letter outlining this problem:—"We plan to install cold air ducts in the office areas of an old building. How should insulation be applied to these ducts so they can be neatly finished and painted to match surrounding walls and ceilings?"

The drawing above illustrates a simple method of applying Armstrong's Corkboard Insulation to air-conditioning ducts. Here, after the duct surfaces have been cleaned, Armstrong's No. 340 Adhesive is spread on the corkboard with a notched trowel. The corkboard is then applied to the duct surfaces and secured with copper-clad wires or metal bands.

On ducts greater than 3′ in any one direction, use metal bands only. Metal bands on the bottom of ducts wider than 6′ should be secured in the center with sheet metal screws or mechanical fasteners to hold the band in place.

For the finish, the corkboard surfaces are first covered with 2″ galvanized wire mesh stapled or laced in place. Exposed corners are fitted with corner beads. Plaster—mixed one part portland cement to three parts asbestos cement—is then applied in two coats. The first coat is allowed to dry thoroughly, then followed with a second coat. When dry, this finish may be painted with two coats of alkali-resistant paint to match the room.

An alternate method of finishing ducts (not shown) employs a covering of 8-oz. canvas. Rosin-sized paper is first applied with edges lapped at least 3″. The canvas is then stretched tightly in position and secured with blind seams or pasted seams. Finally, cold water sizing is applied, allowed to dry, then painted. While both finishes are entirely satisfactory, the canvas finish is somewhat more expensive to install. However, it offers exceptionally neat appearance, durability, and paintability.

Next time you're planning an insulation job, get in touch with an Armstrong engineer. His understanding of insulation problems and materials will prove valuable to you. In addition, Armstrong's Contracting Service can take over the entire job for you—furnish top-quality materials and the skilled workmen to apply them properly. Just call your near-by Armstrong office.

* * *

SEND US YOUR QUESTIONS: If you have any questions on insulating materials or their use in low-temperature installations, please write us. We'll see that you get a prompt, practical answer. Address your letter or post card to Armstrong Cork Company 4404 Concord Street, Lancaster, Pa.

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"400" PORTABLE POWER DRIVE

RIDGID "400"—bench model or stand with tray, capacity ¼" to 2"—to 12" with geared tools.

Time-and-work-saving power for hand threaders, cutters, reamers

★ Extra light-weight unit—one man can handle it.

★ Lots of power—universal motor, forward, reverse, won't bog down on large pipe.

★ RIDGID design 3-jaw chuck, chuck wrench ejector; self-centering workholder in rear turns with pipe.

★ Sealed-in lubrication—no oil to spill.

★ See the remarkable "400" at your Supply House!

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RIDGID
Work-Saver Pipe Tools

ject to wear. The vinyl plastic backing is 20 mils thick. The tape has a dielectric strength of 22,500 volts, an insulation resistance of 200,000 megohms, and an electrolytic corrosion factor of 1.0. It is available in 36 yd rolls, ranging in width from ¼ to 16 in.

Tape

Ventilator

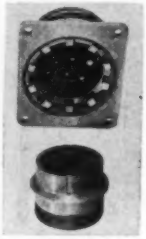
Power Roof Ventilator

HPAC 16—Upblast power exhauster designed with low silhouette — The Gallaher Co., 4108 Dodge St., Omaha 3. The largest model, rated at 22,000 cfm, stands 54 in. high, and smaller models range down to a 42 in. height with a 10,250 cfm capacity. The low silhouette is intended to cut down on overturning effect. Fan blades (four or six) are designed for field replacement without requiring purchase of the complete wheel. Motors are totally enclosed standard types, and d-c and special voltage models also are available.

Console Desk for Obtaining Numerous Process Point Temperature Readings

HPAC 17—Console desk which makes it possible for one operator to obtain plant temperature readings of up to 96 processing points — Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Wayne & Windrim Aves., Philadelphia, 44. All the readings can be indicated in about as many seconds while the operator is seated at the desk, the manufacturer states. It is arranged with cutouts to accommodate the company's precision indicator and key switch banks or push button assemblies. The 60 in. wide steel desk is equipped with conventional drawers, hand slides, etc. It can be used in any large control room, and tied in with single, multiple, or colorgraphic panel boards. The seated operator does not obscure full view of the panel board from any part of the control room.

Desk

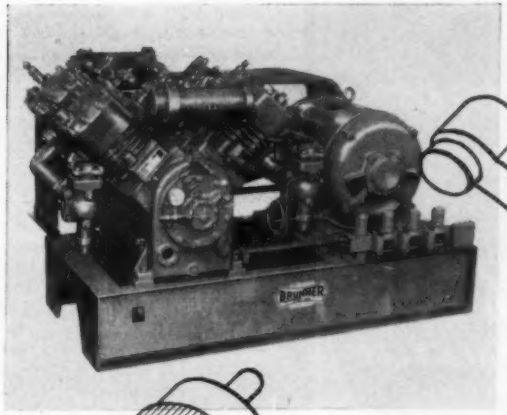


Coupling

Breakaway Coupling

HPAC 18—Electrical breakaway coupling, carrying both electrical and gas or fluid lines through standard inserts, which disconnects automatically when a pre-set pull is exerted — E. B. Wiggins Oil Tool Co., Inc., 3424 E.

● The Brunner background of meticulous engineering and precision manufacture is evident in every detail of *all* Brunner refrigeration and air conditioning units. Install Brunner and assure your customers of what they want most—long years of dependable refrigeration or air conditioning with a minimum of maintenance bother.



Every detail engineered to MINIMIZE MAINTENANCE

...and make contracts easier to close

● If you are in business to sell and install air conditioning and refrigeration, there is food for thought in the rapidly increasing number of Brunner Contractors.

We have the capacity range in equipment and the manufacturing facilities to deliver. Our application engineering staff is ready with the kind of help that wins contracts.

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Self Contained Units to 10 hp.
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Condensing Units from ¼ hp. to 75 hp. 69 Air and Water Cooled Models.

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Single stage ¼ hp. to 2 hp. Two stage 1½ hp. to 15 hp. Horizontal and Vertical Models.

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DEPENDABILITY
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GOVERNAIR
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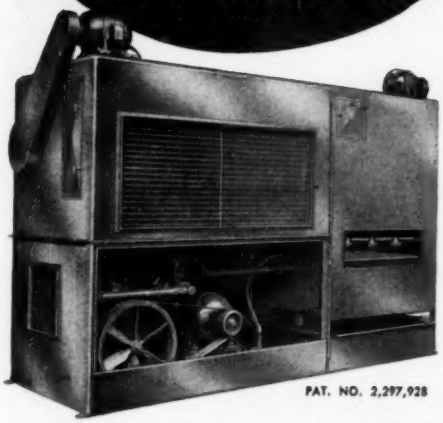

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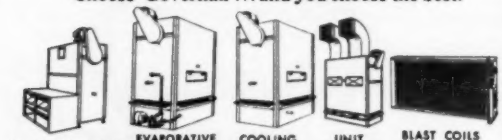
Governair Packaged Air Conditioners are designed to operate at peak efficiency—with all parts precision-matched to work together. And they're built to give years and years of low-cost, trouble-free service.

Choose Governair . . . and you choose the best!



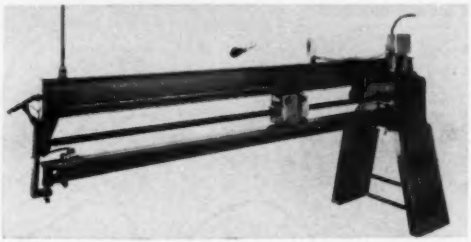
AIR CONDITIONERS | EVAPORATIVE CONDENSERS | COOLING TOWERS | UNIT COOLERS | BLAST COILS FOR HEATING AND COOLING

GOVERNAIR

Olympic Blvd., Los Angeles 23. No wrench is used to join or separate the coupling, which has been pressurized and tested to 750 psi, the company states. A series of "fingers" around the circumference of one half grips or permits ejection of the other. Separation is established by spring tension and can be set for a pull of 5 lb, 10 lb, or any other amount. Configuration of the envelope can be flange, ring, or other shapes.

Sheet Metal Joiner

HPAC 19 **—Mechanical sheet metal joiner designed to automatically seam sheet metal of any thickness from 18 to 30 gage — Standard Power-Groove Machine Corp., 99 Hudson St., New York 13. The unit permanently seams two sheets of metal in about 40 seconds, exerting 11,000 lb psi, the manufacturer states. Working from pressure de-



rived from force which the roller assembly exerts against an overhead structural steel beam, it travels in one direction, and automatically reverses direction for a second and final operation which smoothes the seam. The unit is intended to take any piping up to 8 ft in length, and to handle square or round piping, in addition to straight seaming. Its overall length is 10 ft.

Water Hardness Tests

HPAC 20—Dr. Gerold Schwarzenbach, Swiss scientist, has been granted U. S. patents which cover new water hardness tests designed to provide total hardness determination rapidly, simply, and to an accuracy within 1 part per million — Hagan Corp., and its associates, Calgon, Inc., and the Buromin Co., 323 Fourth Ave., Pittsburgh 22 (all licensed under these patents). Hall Laboratories, Inc., a Hagan Corp. affiliate, has worked out modified procedures, reagents and equipment designed to make the basic Schwarzenbach methods convenient for field use. Total hardness and hardness due to calcium alone can be determined by the new methods. Magnesium can be determined by difference. With no special precautions, 1 ppm of hardness as $CaCO_3$ is detected. The endpoint for total hardness is sharp and readily detected, and there is no limitation on sample size, the company states. The procedure is as follows: a measured sample is poured into a dish; buffer solution is added, and the sample mixed; indicator is added and stirred, turning the water red; titration turns the color from red to bluish at the endpoint.

Duplex Tank Bushing

HPAC 21**—No. 750 duplex tank bushing designed to speed up installations and reduce costs by allowing suction and return lines to be inserted in the same tank opening — Universal Valve Co., P. O. Box 444, Elizabeth, N. J. The bushing has a pipe thread tapping on the underside of the suction opening to permit threaded pipe installation di-

The SYNCHROTON symbolizes the vital role of ♀

A proton synchroton magnet—also called a cosmotron because it will produce artificial cosmic rays and speed protons to an energy exceeding 2-billion electron volts.

The proton synchroton, or cosmotron—so called because it will produce cosmic rays—provides an important link in this nation's nuclear research program and is a vital part of the Atomic Energy Commission's equipment. Within this giant magnet shown being completed (above) are over 70 tons of copper and copper base alloys. The majority of this metal is extruded oxygen-free copper windings. In total there are more than 100 tons of copper in the installation including other coils and windings, the cooling system, hundreds of miles of copper wire and bus bar. COPPER plays many of America's most vital roles today . . . and in hundreds upon hundreds of these you'll find HUSSEY COPPER.

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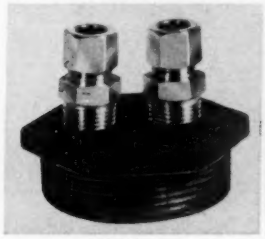
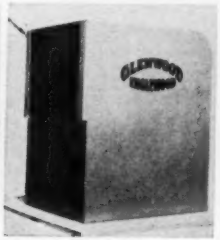
424 Commercial Square

rectly into the tank. It has a cast iron body, standard compression (slipthrough) brass fittings, and is available in sizes of ⅜ x ⅜ x 2 in; ½ x ½ x 2 in.; and ⅜ x ½ x 2 in. Tubing sizes are OD.



Bushing



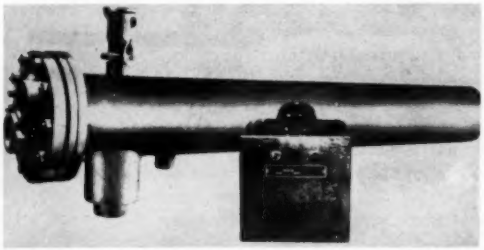
Dehumidifier

Dehumidifier for Compressed Air

HPAC 22**—Model CA-12 automatic dehumidifier for compressed air — The Glenwood-Inglewood Co., Glenwood Ave., at Thomas, Minneapolis 5. It includes a "Tecumseh," hermetically sealed, 1/16 hp "Freon-12" condensing unit in a new circuit incorporating a sealed time-delay relay and disc thermal overload protection. Dual heat exchangers are arranged to reheat the dry leaving air. Applications include pneumatic control systems, industrial processes, chemical laboratories, etc. The unit is 12 x 17 x 20 in. high, weighing 85 lb. It carries the Underwriters' Label for 125 psi.

Control for Detecting Oil Leaks in Heater Tubes

HPAC 23—"Paraprobe" safety control (shown with fuel oil heater), an electrical device for continuously monitoring conductive liquids to detect undesirable contaminations and give adequate warnings — Davis Engineering Corp., 1064 East Grand Street, Elizabeth 4, N. J. An exploratory electrode or probe is used to impose a fixed low voltage on the liquid stream under scrutiny. If there is contamination, the change in the electrical conductivity of



the liquid causes the control relay to close the alarm circuit. When used with oil preheaters, a second set of contacts in the snap switch controls the operation of the oil burner and pump. In below the line installations, the probe is placed at the top of the horizontal heater shell, and if an oil leak develops, the control relay opens the oil burner and oil pump circuits, thus stopping the oil flow. When used with steam oil heaters, it is placed in the condensate line from the heater.

Electric Dehumidifier

HPAC 24*—Electric dehumidifier for servicing enclosed spaces of up to 10,000 cu ft, and designed to remove up to 3 gallons of water per day — Westinghouse Electric

A fan for every need

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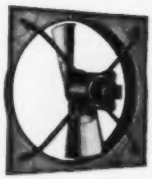
Direct Drive Unit Blowers *are available in 11 models. Wheel size from 6" to 11". Choice of speeds available in each size. These units may be mounted on floor, wall or ceiling.*

Direct Drive Propeller Fans. *Both small sizes for use in offices, laboratories, etc. and also heavy duty units commonly used where contaminated air cannot penetrate the totally enclosed motor. Sizes from 14" to 36". Capacities up to 12,400 c.f.m.*



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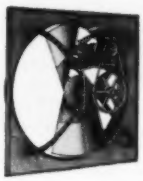

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Division of AMERICAN AIR FILTER COMPANY, INC.

MOLINE, ILLINOIS

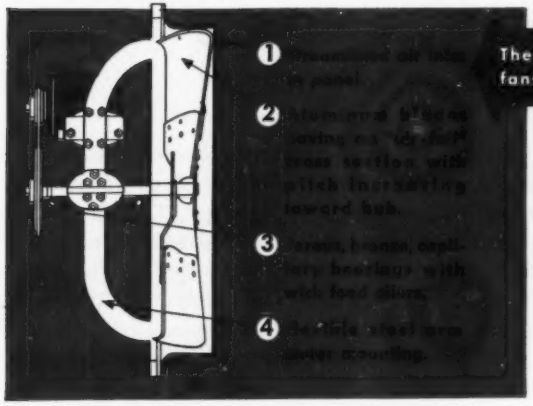
...FROM

HERMAN NELSON

In the industrial plant shown above 43 Herman Nelson Propeller Fans insure comfort cooling for employees working at heat-producing, high speed machines.

No matter what type or size of ventilating fan you need for industrial, commercial and institutional use Herman Nelson makes it. Our designers and engineers are leaders in the fan field and in our laboratories and test rooms all the latest findings of aerodynamic science are put to work in fan design. Herman Nelson fans are noted for low initial, operating and maintenance costs. They are designed to operate with minimum air turbulance, thus permitting the delivery of more air with less noise.

The Herman Nelson line includes Propeller Fans, Unit Blowers and Class I and II Centrifugal Fans. All Herman Nelson fans are tested and rated according to Standard Code of the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.



The key superiority of Herman Nelson propeller fans is the exclusive design of the fan blade.

The blades have an "air-foil" cross section which results in greater efficiency and quieter operation. The tendency toward over-loading, common in propeller fans, is minimized by advanced Herman Nelson design. Lower initial, operating and maintenance costs are assured.

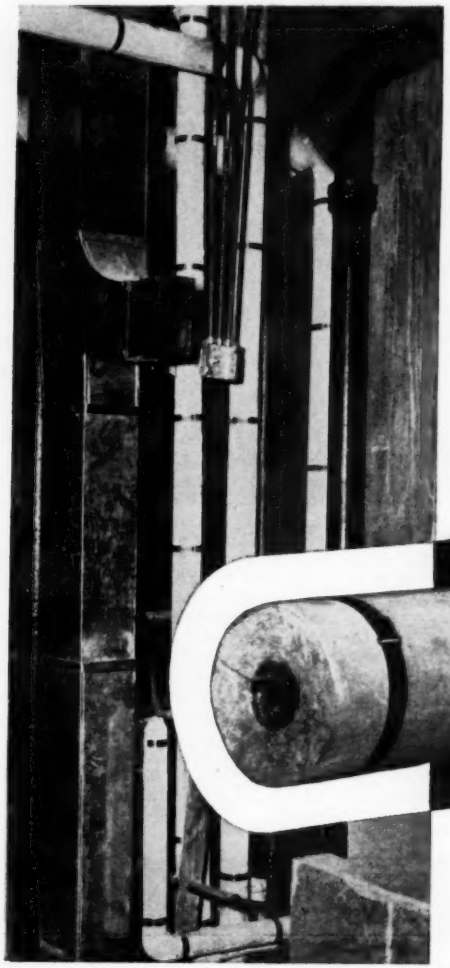
Fan blades of all Herman Nelson Propeller Fans are fabricated of aluminum and are formed by the hydraulic pressure method for extreme precision. The outer edge of each blade is flanged to increase strength and rigidity.

AAF herman nelson moline illinois

HERMAN NELSON

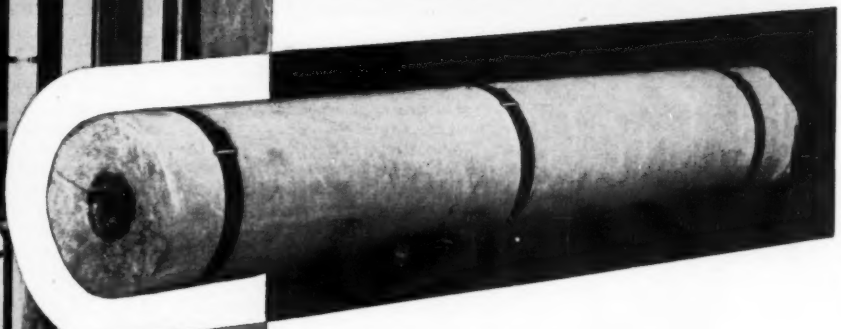
Division of **AMERICAN AIR FILTER COMPANY, INC.**

MOLINE, ILLINOIS



YOU SAVE FROM THE VERY BEGINNING WITH

Amocel



...the easy-to-use, long lasting pipe insulation

Probably no one will ever again need to see this installation of long-lasting Amocel, for "out of sight means out of mind" with this durable insulation. There's no concern about replacement, because Amocel lasts the life of the building, so steam and hot water lines need not be accessible for insulation maintenance. Amocel is Unarco's economical pipe insulation for all commercial uses up to 600° F. temperature. For higher temperatures—up to 1200°—specify Unarco Unibestos. Phone your nearby Unarco Distributor for information and from-stock deliveries. *Write for Bulletin 76-109.*

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In Chicago and Kansas City, insulation users look to Jamar-Olmen for prompt service on Unarco products.

Ample stocks are maintained at both locations, and fleets of Company-owned trucks speed deliveries throughout the trading areas.

Helpful assistance, in recommendation and selection, is always available from J-O engineers to aid in designing and in field application.

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PRODUCTS OF

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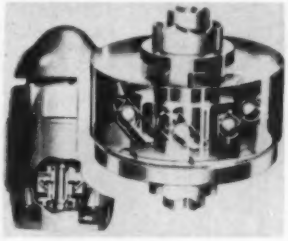
Corp., Electric Appliance Div., East Springfield, Mass. The drier is 24 in. high, 14 in. wide and 19 in. deep. It is portable, can be operated on standard 115 a-c current, and needs no plumbing or other permanent installation.

Dehumidifier



Backstop

Backstop for Vertical Motors

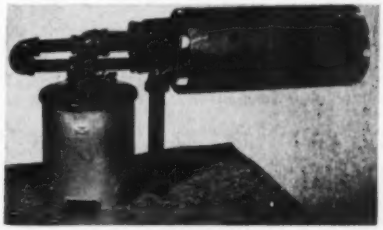
HPAC 25—"Ballomatic" backstop which utilizes balls to prevent reversal of vertical hollowshaft motors and subsequent back-spinning of vertical turbine water pumps — U.S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54. When the motor starts, centrifugal force throws the hardened steel balls out of engagement with the stationary member. When it stops, gravity pulls the balls down and one of them engages between the rotating member and the stationary ratchet, preventing reversal.

Flexible Metal Conduit and Hose

HPAC 26**—Flexible metal conduit for a variety of shielding applications, and flexible metal hose for both fluids and gases — Flexible Metal Hose Mfg. Co., 640 W. 17th St., Costa Mesa, Calif. Conduit and hose are pressure tested, warranted to withstand all specified pressures, and meet a broad range of Army, Air Force and Navy specifications, the company states.

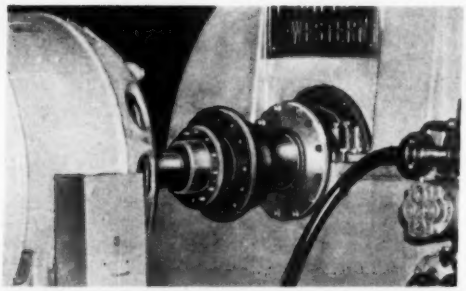
Heating Device Which Burns Liquid Fuel in the Form of Gas

HPAC 27**—Unit which generates gas from heavy liquid fuel (kerosene, No. 1, 2, and 3 fuel oil, etc.), designed to save fuel costs when installed in standard hot water and heater oil burner tanks, and when used in in-



dustrial applications such as forging, heat treating, etc., as a substitute for manufactured gas — Robert Reichhelm Co., Stratford, Conn. With this device, the hot water heater burns heavier fuel, leaves no carbon, and requires no chimney or draft (a small pipeline being used as a vent), the manufacturer states. It operates on a 1/40 hp motor. The principle involved in both hot water and heating units is the vaporization of the liquid fuel by means of regenerated hot air. The device, 6 in. in di-

YOUR BEST INSURANCE
AGAINST
Coupling Failure



WALDRON
Improved GEAR TYPE
Couplings

The newest development in gear coupling design. Actually built to eliminate common causes of coupling failures. Construction features that definitely improve operation and greatly increase service life. Among many WALDRON refinements are:

- Forged steel parts for safer operation at high speeds.
- One piece cover sleeve to insure accurate sleeve gear.
- Lubricant hermetically sealed against oxidation.
- No chance of wear from metal-to-metal contact.
- Changes in standard basic design can be made for special applications.

Write for descriptive Catalog No. 57 for detailed information.

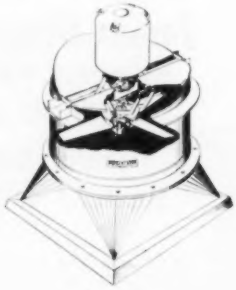
JOHN WALDRON CORP.
NEW BRUNSWICK NEW JERSEY
Sales Representatives in Principal Cities

ameter and 4 in. wide, can be installed in standard oil burning hot water heater tanks without requiring major change. The company is now contracting with a manufacturing firm for production and sales.

Stainless Steel Dial Type Thermometers

HPAC 28—Dial type, stainless steel thermometers, in which stainless steel weld replaces silver solder at stem and case (see arrows in illustration), resulting in one piece construction of stem and plug — Rochester Mfg. Co., 63 Rockwood St., Rochester 10, N.Y. The new construction insures equal ability to withstand corrosive and erosive conditions on all exposed surfaces, and it will eliminate the need for separable sockets for many process applications, the manufacturer states. A special recalibration device is available on these thermometers.

Thermometer



Ventilator

Industrial Power Roof Ventilator

HPAC 29**—"Posit-Aire" roof type ventilator, designed to move air in volume range of 5000 to 15,000 cfm depending upon size — Tripar Products, Inc., Dept. 150, 14641 W. Eleven Mile Rd., Royal Oak, Mich. As the fan starts, mechanically actuated louvers open fully and automatically. Power to open them is provided by the fan drive motor through a lever clutch mechanism. When the fan stops, louvers close and lock in closed position until the unit is turned on again. This louver design is intended to prevent entrance of rain or snow, to eliminate drafts when the unit is not operating and to prevent backdraft. Standard sizes range from 24 to 48 in. Special sizes can be furnished.

Furnace and Boiler Vacuum Cleaner

HPAC 30**—Heavy duty furnace and boiler vacuum cleaner, for small commercial installations and homes, with a capacity of 1½ bushels — Pullman Sales Corp., 31-39 Allerton St., Boston 19. The unit is portable, weighing 30 lb with attachments. An internal filter is used. The vacuum can be converted to a blower for soot in tubes, with the company's automatic hose coupling.

Rust Removing Treatment Which Phosphatizes Metals

HPAC 31**—"Rustclean" chemical treatment designed to remove rust, retard corrosion, and form a base for organic finishes by creating a phosphate coating — Octagon Process Inc., 15 Bank St., Staten Island 1, N. Y. It can be used on the surfaces of steel, iron, aluminum, zinc and cadmium, and in applications such as pipeline and

The Discharge Outlets of all these Heaters REVOLVE Why?

The buildings illustrated on this page have one thing in common—they are all comfortably, thoroughly, pleasantly heated by Wing *Revolving* Unit Heaters. From airplane factory to automobile showroom—from gigantic railroad terminal and high-ceilinged factory to railroad repair shop, working conditions are ideal because the heated air from overhead is circulated slowly and uniformly in gently revolving streams. Isn't that the sort of heating you want in *your* plant? Get the details. *Write for bulletin.*

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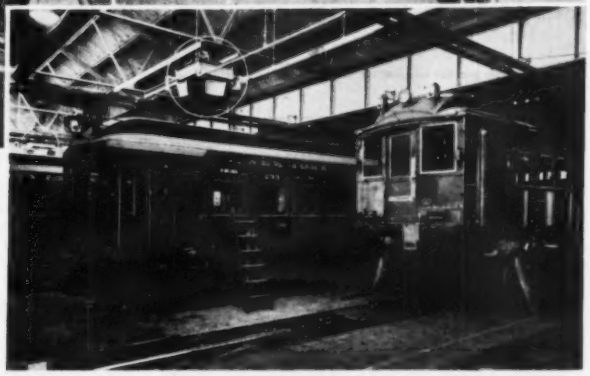
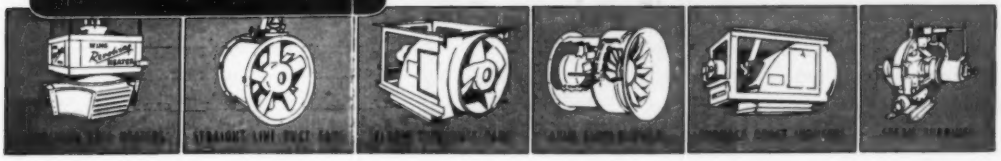
Factories: Linden, N.J., Montreal, Can.
In Europe: WANSON, Brussels, Belgium



Wing

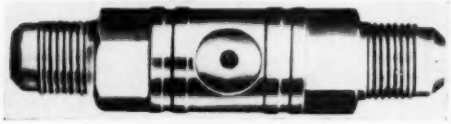
REVOLVING UNIT HEATERS



storage tank maintenance. It contains a mild acid which does not fume or emit toxic vapors, and can be used in the same area where steel is finished or stored, according to the manufacturer. It is available in a variety of types (different concentrations, etc.) to fit specific applications.

Flow Line Indicator

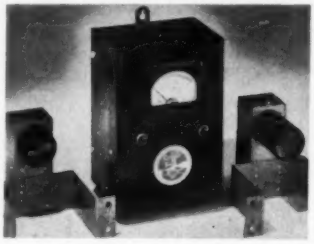
HPAC 32**—"Liquid Eye" indicator which is incorporated into the line and permits visual inspection without need for reading pressure gages — Allin Mfg. Co., 1153 W. Grand Ave., Chicago 22. It consists of a brass housing in which is inserted a transparent high pressure "Pyrex"



tube with a ceramic eye which visually magnifies when the liquid line is full. The gasket material is impervious to action by liquids that are not affected by brass and it does not decompose or swell, the company states. Three styles are available in copper tube sizes of ¼, ⅜, ½ and ⅝ in.

Smoke Indicators and Controls

HPAC 33*—Photoelectric cell systems for providing a check on smoke density — Cleveland Fuel Equipment Co., 7316 Associate Ave., Cleveland 9. It consists of a light source; a photoelectric cell whose output is proportional to the density of the smoke; and a master control with amplifier, relay, smoke density meter calibrated in Ringelmann units, and signal lights. The master control can be set for a predetermined smoke density. A non-adjustable time delaying circuit permits a small amount of smoke



to pass before starting the control, eliminating cycling of the equipment. Standard units are available for either 110 or 220 volt, 60 cycle current.

Dye Penetrant Metal Inspection Process

HPAC 34—Non-toxic "Dy/Chek" formula for detecting flaws or defects in ferrous and non-ferrous metal surfaces — Turco Products, Inc., Terminal Annex 2649, Los Angeles 54. After pre-cleaning, a red dye is applied, allowed to remain long enough to "hide" in the flaws, and then removed. A white developer then applied dries, pulling the hidden dye to the surface, thus marking defects.

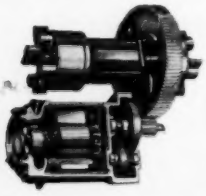
Arc Welders

HPAC 35—Model GA "Wasp" direct current arc welders in 150 and 200 amp sizes — Air Reduction Sales Co.,

QUIJADA CHIEF

Four jaws automatically grip and center pipe or conduit from 3/8 in. to 2 in. in size.

QUIJADA power driven **INSTANT** automatic chucking



SPEEDS—SIMPLIFIES PIPE AND CONDUIT THREADING

Just insert pipe, pull the instant action switch, and pipe is automatically centered and turning for threading. No wrestling with stubborn chucks...no chuck wrenches to cause trouble. This exclusive QUIJADA feature saves time and energy—cuts dollars from your production costs. If you're not using a QUIJADA you're losing money. Clip coupon below and paste on post card for more detailed information.

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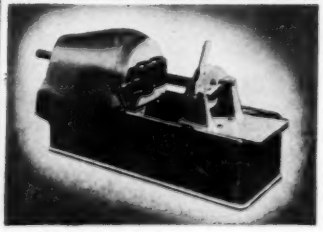
INTERCHANGEABLE JAWS

Front and rear jaws interchange for longer life. Return to factory for free sharpening when dull.



Quijada Tool Co., Inc.
5474 Alhambra Ave.
Los Angeles 33, California

Gentlemen: Please send me your new catalog HP-4

NAME_____

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60 E. 42nd St., New York 17. They are especially suited to d-c straight polarity "Heliwelding" with "Thor-Tung." Continuous overlap from each current range to the next provides a wide, unbroken range of welding current, 30 to 250 on the 200 amp welder, and 20 to 185 on the other, the manufacturer states.

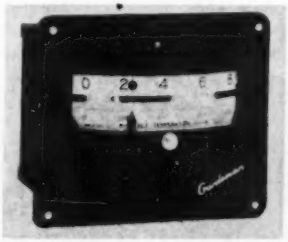
Automobile Air Conditioning System

HPAC 36—Model K-4 car air conditioning system, utilizing a four-piston compressor which affords a refrigeration capacity of over three tons — Kool-Kar Co., Inc., 1468 Penobscot Bldg., Detroit. Fresh air vents, located in the rear fenders, allow a complete change of filtered air every 35 seconds, the company states. The condenser coil is in

front of the engine radiator, the receiver tank is beneath the front fender, the compressor is on the engine block and, on the deck in the trunk, is the case consisting of the evaporator coil, expansion valve, fans and motors. Luggage space is left intact. On road tests, with temperatures ranging from 90 to 110 F, the system showed a drop of 15 degrees with "a dehumidifying action of almost 30 percent," according to the manufacturer.

Pyrometric Controller

HPAC 37**—Model JP "Gardsman" proportioning indicating pyrometric controller for maintaining temperatures in various industrial processes, for use in extruding and industrial heat treating fields, etc. — Taco West Corp., 525 N. Noble St., Chicago. It automatically adjusts the ratio of power "on" and "off" over a given time



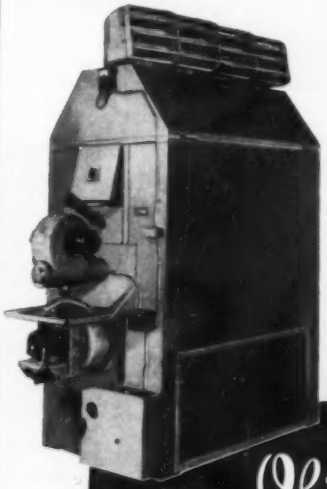
cycle to maintain the temperature set with the index pointer. This results in a "straightening out" of the temperature control curve. The instrument thus anticipates and corrects for thermal inertia by preventing control point overshooting on most installations, the manufacturer states. It is available in 36 standard scale and thermocouple ranges and operates on either 115 or 230 volt, 60 cycle current.

Powder Actuated Fastener with Elasticized Tip

HPAC 38—"Tru-Set" fasteners, for use with powder actuated tools, which incorporate an elasticized red tip

A STRIGHT LINE

A straight line is the shortest distance between two points. Likewise, the more heat transfer surface, the more efficiency and longer life for a heating unit. Olson, through the use of standard 10 gauge, 4" O. D. boiler tubes, gives more effective heat transfer surface than the highest recommendations of accepted heating authorities.



Olson unit or central warm air heaters are manufactured for stokers, oil, gas or dual gas and oil to fit the needs of all regions and various structures.

Olson

ARTHUR A. OLSON & CO.
Gas, Oil, Coal or Dual Gas and Oil
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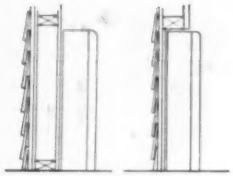
Designed for Quick, Easy, Time-Saving Installation

Attractive appearance, outstanding performance and ease of installation have led to an increasing preference for Airtherm Convectors in institutions, apartments, homes and schools
Try AIRTHERM on your next job.
An Airtherm Heating Installation is your assurance of a satisfied customer.

Airtherm Convectors are available for either free standing or recessed installation.

Write for Catalog 702A for additional information.



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SEE OUR CATALOG IN SWEET'S

For Heating Satisfaction . . . Think First of AIRTHERM

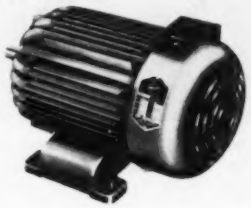
AIRTHERM MANUFACTURING COMPANY

711 South Spring Avenue • St. Louis 10, Missouri

designed to hold them straight in tool barrels and to pilot them into the work — Ramset Fasteners, Inc., 12117 Berea Rd., Cleveland 11. The fasteners are inserted in the breech plug right under the powder load. The tip, slightly larger than the barrel, completes the seal and prevents the fastener from being tilted while in the barrel. The fasteners provide automatic cleaning of tool barrels, and virtually eliminate the need for manual straightening, the company states. They can be used to fasten steel and wood to concrete, wood and steel to steel, etc.

Totally Enclosed Motors

HPAC 39—Series of totally enclosed, and totally enclosed fan cooled motors ranging from ¼ through 3 hp — The Hoover Co., Kingston-Conley Div., 68 Brook Ave., North Plainfield, N. J. Smaller ratings are totally enclosed; intermediate, totally enclosed fan cooled; and larger ratings, totally enclosed fan cooled, with the addi-



tion of external fins for greater heat dissipation. All blind passages that might accumulate dirt have been eliminated on fan cooled models, and compact design has been stressed, the manufacturer states. The fan shroud can be removed, exposing the cooling system without disassembly of the motor.

Measurer-Recorder for Very Low Pressures

HPAC 40**—Type 3-B "Minicorder" for measuring and recording very low pressures, which is designed for chart records as low as 0 to 10 in. head of water pressure, with other chart ranges available as high as 0 to 60 psig — The Dickson Co., 7420 Woodlawn Ave., Chicago 19. Overall dimensions are 5¼ x 5¼ x 2¼ in. deep. (One model is 3½ in. deep). Weight is 2 lb. Range adjust-

ment is possible at any point on the chart, for exact setting. The entire operating unit is assembled to a heavy lacquered dial, with all parts interchangeable. Measuring elements consist of a series of brass bellows which provide power to move the pen across the chart. For certain ranges, stainless steel bellows may be specified. Suggested applications include fan ventilating systems, manufactured gas distributing systems, etc.

trouble-free underground conduits

are assured with..

"Z"crete CAST IN PLACE **INSULATION**

NO OTHER INSULATION FOR UNDERGROUND PIPING...

OFFERS ALL THESE ADVANTAGES

Extra efficiency—Greater insulation thickness provides plus insulation value. Monolithic, contains no joints to leak heat.

Added protection—Cast-in-place construction eliminates voids and joints, assures restricted water movement around the pipe assembly.

More Economical, particularly on large-size piping and multiple conduits. Permanently efficient, lasts a lifetime.

More Adaptable—Any size, arrangement and number of pipes can be included in the conduit.

Readily Available—Materials for "Z"-Crete construction are on hand in plants in key cities throughout the U.S., Canada and Alaska. No critical materials involved in the "Z"-Crete method.

Permanent—"Z"-Crete insulation will not disintegrate, deteriorate, crack or crumble. Verminproof, rodent-proof.

for *NEW* CONSTRUCTION

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CLEAN OUT THE OLD — POUR IN THE NEW — INSULATION TROUBLES ARE THROUGH

"Z"crete DIVISION

Licensed applicators in all principal cities.

**Z-Crete is a registered trademark of Zonolite Company*

Write for design data and other information to Dept. HPAC 42

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BLACK & DECKER ELECTRIC PORTO-SHEARS* cut sheet metal too tough for snips. Speed up jobs where snips are slow. Save you time and cut your costs on hundreds of jobs. Fast, powerful shearing action eliminates hard muscular strain. Easy to follow straight lines, irregular patterns, curves to small radius because *cutting action is always visible!* Two models: 12-gage and 16-gage capacities.

BLACK & DECKER ELECTRIC HAMMERS speed up such jobs as drilling holes for toggle bolts in concrete and brick—cutting mortar out of joints to install flashings — cutting through walls, shaping timbers, channeling floors. High-speed, amazingly husky, deliver thousands of sharp, positive hammer blows per minute. Drive star drills, speed bits, chisels, many other tools. Light, compact, completely self-contained, require no transformer or extra equipment. Four models: rated by drilling capacity in concrete for ½", ¾", 1⅛", 2".

SEE YOUR NEARBY B&D DISTRIBUTOR for demonstrations, full details, expert help in selecting the right tools for your jobs. Write for free catalog to: THE BLACK & DECKER MFG. Co., 628 Pennsylvania Ave., Towson 4, Maryland.

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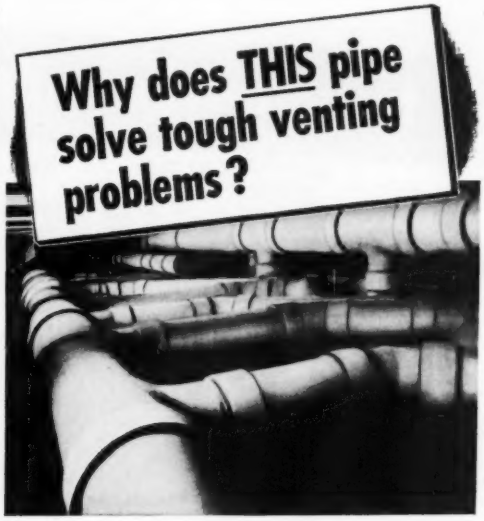


...it's made of corrosion-resistant TRANSITE*

IT'S NO SECRET why Transite* Industrial Vent Pipe has solved difficult venting problems for many plant engineers . . . and thereby lowered their maintenance costs.

This tough, durable asbestos-cement pipe successfully resists many of the corrosive fumes, vapors, and gases encountered in a wide variety of industrial operations . . . helps avoid frequent replacements that waste both time and money.

In addition, Transite Industrial Vent Pipe is nonmetallic and therefore rustproof—needs no painting or other protective treatment. It can be used as ducts, vents or stacks in either indoor or outdoor service.

Plant men appreciate its light weight, plus the fact that it can be cut and drilled with ordinary tools. And it comes in a complete range of sizes up to 36" in diameter . . . with a complete line of rustproof, corrosion-resistant fittings that adapt it to practically any job requirement.

You will find further details on Transite Industrial Vent Pipe in Data Sheet Series DS-336. For your copy write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto, Ontario.

JM

*Transite is a registered Johns-Manville trade mark.

Johns-Manville TRANSITE Industrial Vent PIPE

WE HEAR THAT . . .

THE OLD TIMERS CLUB OF THE OIL BURNER INDUSTRY, INC., holds its annual Jamboree on Tuesday evening, April 15, at the Lu Lu Temple, 313 S. Broad St., Philadelphia. A booth will be open Sunday, Monday and Tuesday, at the Oil Heat Show, for new applications, dues payments, and Jamboree reservations. Prior reservations should be made with H. A. Maccubbin, national secretary, 120 W. Madison St., Villa Park, Ill.

Freedoms Foundation of Valley Forge, Pa., has awarded *THE YOUNGSTOWN SHEET AND TUBE CO.*, Youngstown, Ohio, gold medals for the second year in succession, for the company's national advertising program and its employee magazine.

UNITED STATES AIR CONDITIONING CORP., Minneapolis, has consolidated its metropolitan New York sales force into a single, central agency, with its main office at 420 Lexington Ave. The field office has been combined with the manufacturer's agent in the area.

THE ARMSTRONG CORK CO., Lancaster, Pa., sold $201,134,473 worth of goods in 1951, the largest volume in its history. This resulted in net earnings after taxes of $8,529,600.

Engineered Air Distribution is a 30 minute color film produced by *BARBER-COLMAN CO.*, Rockford, Ill., as an aid to architects, engineers, and contractors in designing air distribution systems. It tells the story of precision engineering of grilles, ceiling outlets, and accessories and discusses factors affecting selection of units. The film is being shown by the company's field offices.

GEORGE R. STOUT, manager of the Point Comfort Works (near Port Lavaca, Tex.) of *ALUMINUM CO. OF AMERICA*, recently snapped the switch setting the first of two new smelting lines into operation. The new line increases the plant's production capacity to about 135,000,000 lb of aluminum annually.

THE BABCOCK & WILCOX CO., New York, has started construction on a new plant in Paris, Tex., which will be used to manufacture components for large utility and industrial boilers. It will employ 750 men, and will have a roofed area of 135,000 sq ft.

A complete five-year warranty is being offered by *AIRTEMP DIV., CHRYSLER CORP.*, Dayton, Ohio, on the compressor assembly in its packaged air conditioner. It provides for replacement or repair in the event of failure due to materials or workmanship.

THE BRYANT HEATER CO., Cleveland, and the *F. W. WAKEFIELD BRASS CO.*, Vermillion, Ohio, have established fellowships, offered through *CASE INSTITUTE OF TECHNOLOGY*, Cleveland, for men interested in heating, air conditioning, and related technical fields. The stipend will be $2,650 for one full year of study, under each of the grants. The Bryant stipend covers combustion, corrosion, heat transfer and other problems; the Wakefield grant is for research in thermal environment.

In outlining the company's sales program for this year, *FRANK A. MITCHELL*, sales manager, *FEDDERS-QUIGAN CORP.*, New York, predicted that sales of room

400 TONS•CAPACITY

PATENTED DUO-PASS and OILOUT

Aeropass CONDENSER

U. S. Patent Reissue No. 21,917; 22,533

YOU USE LESS POWER...
SAVE CONDENSER WATER...
SAVE UPKEEP COST

For large refrigeration systems, NIAGARA gives you a choice between a battery of condensers (that may be cut on or off with the load) or a high capacity condenser that saves space.

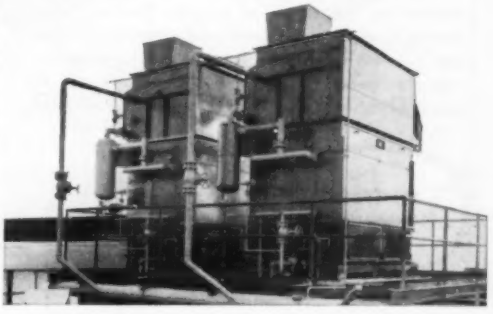
Both have the patented "Duo-Pass" and "Oilout" that remove superheat and keep the system free of oil. Results: you save one-third or more of power cost and upkeep expense. Niagara Patented Balanced Wet Bulb Control gives lowest head pressure operation automatically. *Write for Bulletin 111.*

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

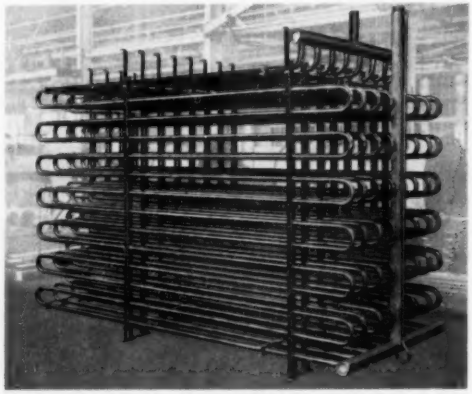
Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Field Engineers in Principal Cities of U. S. and Canada



Check Your Refrigeration Needs *NOW!*

NOW is the time to get set for warm weather . . . and Whitlock is ready to help you with your refrigeration requirements. As with this recently completed Whitlock refrigeration coil, trouble-free operation is a built-in characteristic of Whitlock equipment. Each Whitlock unit gives efficient low-cost service because it is carefully designed, competently constructed, and fully tested in our plant.



Ammonia coil for ice plant, fabricated of 1¼" std. black pipe with 3" std. pipe headers. Notice the supports which assure rigidity in service.

Whitlock offers you a wealth of experience in the manufacture of condensers, receivers, welded headers, prefabricated piping, coils, and allied products. Whether you are freezing ice or keeping customers comfortably cool, it will pay you to consult Whitlock on your new and replacement refrigeration needs. Write for Whitlock Bulletin No. 140 describing the full line of Whitlock Refrigeration Equipment.

THE WHITLOCK MANUFACTURING CO.

44 SOUTH STREET HARTFORD 10, CONN.

NEW YORK • BOSTON • CHICAGO
PHILADELPHIA • DETROIT • RICHMOND

Authorized Representatives in Other Principal Cities

IN CANADA: DARLING BROTHERS, LTD., MONTREAL

air conditioners in the New York area would increase "more than 50 percent" over 1951. He estimated that national sales would be up more than 150,000 over the 250,000 sold last year.

Two new members of the *AIR CONDITIONING & REFRIGERATING MACHINERY ASS'N.* are *BRUNNER MFG. CO.*, Utica, and *CROSLEY DIV., AVCO MFG. CORP.*, Cincinnati.

U. S. MACHINE CORP. introduced several new models, for burning major fuels, at its two day national convention in Indianapolis, held early this year. The meeting, attended by 700, was preceded by an open house at the Lebanon, Ind., plants, where 375 people registered. Equipment displayed included the "Winkler L-6" low pressure oil burner for commercial installations. The company began the year with a line of 175 different models of commercial, industrial and domestic equipment.

A "sales caravan," designed to acquaint the company's distributors with its air conditioner promotion program, has been started by *MITCHELL MFG. CO.*, Chicago. Under the direction of sales representatives *ROY LAATSCH* and *LEONARD SOLOMAN*, it is now touring the country, and will aim at meeting every distributor in 42 states by May 1.

How a gas attack in World War I opened the way to the use of activated carbons in air purification was a featured topic at the recent first annual conference of sales representatives for *PUR AIR DIV., AMERICAN SOLVENT RECOVERY CORP.*, at Columbus, Ohio. A tour of the plant preceded sales meetings.

A low cost five year protection plan, providing repair or exchange of the hermetic refrigeration motor compressor assembly in "Weathermaker" air conditioning units shipped after Feb. 15, 1952, is offered by *CARRIER CORP.*, Syracuse. The plan can be applied retroactively to units installed since Sept. 1, 1951, on payment of the protection cost. Replacement is not contingent on discovery of a defect in construction.

The name of the *WESTERN VENTILATING AND ENGINEERING CO.* has been changed to *WESTERN VENTILATING CO.* The address remains the same, 1019 West Grand Ave., Chicago 22.

THE SCHAIBLE CO., Cincinnati, manufacturer of heating and plumbing equipment, has purchased a plant in suburban Mariemont, for approximately $1,000,000. The plant, which contains 140,000 sq ft of floor space, was formerly owned by Emery Industries, Inc. It will house the company's manufacturing and executive offices.

HARRY TERRY, consulting mechanical and electrical engineer, is now at a new address: 125 Broad St., New York 4.

C. H. WHEELER MFG. CO. recently broke ground for a $600,000 addition to its Philadelphia plant. The new 300-ft-long building will be equipped with 30 ton cranes. A new centrifugal pump laboratory will be used for testing pumps up to 110,000 gpm.

WHO'S WHAT

CALUMET AND HECLA CONSOLIDATED COPPER CO., Detroit, has consolidated the advertising of its corporate organization and divisions under one advertising department staff, headed by *H. A. HARTY*, advertising manager, Wolverine Tube Div. Headquarters will be the Wolverine advertising offices, Detroit. *CHARLES M. GRAY AND ASSOCIATES*, Detroit, Wolverine agency for the past 12 years, will also handle the Calumet Div. and corporate campaigns.

NORMAN E. TUCKER has been appointed vice president in charge of sales for *REFINITE CORP.*, Omaha. With the company since 1949, he is also manager, Government Contracts Div.

A number of new appointments have been made as part of the program to consolidate the operations of *ECONOMY PUMPS, INC.*, Hamilton, Ohio, as a division of the *C. H. WHEELER MFG. CO.*, Philadelphia. *JOHN M. SPERRY*, formerly assistant to the vice president of the pump company, is now Wheeler's sales manager. Heating Pump Dept., Economy Pump Div. *ZAY B. CURTIS, JR.*, formerly assistant plant manager, Fostoria Pressed Steel Corp., and lately works manager, Hamilton-Thomas Corp., is now assistant to the president at Wheeler. He will be in charge of all manufacturing in the Philadelphia plant, which is being expanded to accommodate the consolidation. *ROBERT J. MacMEEKIN* has been transferred from Hamilton as chief engineer of the new pump division in Philadelphia. In addition, *H. O. FULLAM* is now chief industrial engineer in charge of methods engineering, tool engineering, tool manufacturing and maintenance of plant equipment. Formerly he was with the G. A. Gray Co.

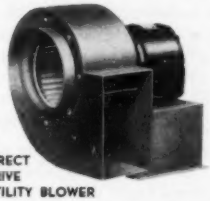
The *NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASS'N.*, Cleveland, has formed an industrial and commercial warm air furnace committee to encourage the use and acceptance of warm air heating systems in the large industrial and commercial fields. Members include *R. C. JAYE*, Syncromatic Corp., chairman; *M. W. BOWEN*, Certified Furnace Co.; *BOWEN CAMPBELL*, Campbell Heating Co.; *ROGER P. CAMPBELL*, E. K. Campbell Co.; *WM. J. KLINGBERG*, American Foundry & Furnace Co.; *WM. H. LAUER*, Columbus Heating & Ventilating Co.; *W. J. MaGIRL*, MaGirl Foundry & Furnace Co.; *ARTHUR A. OLSON*, Arthur A. Olson Co.; *L. S. REDFORD*, Jackson & Church Co.; and *E. M. TARNOFF*, Prat-Daniel Corp.

The consensus of those attending the first meeting was that the opportunity for the use of warm air heating in its various forms in industrial and commercial applications is almost unlimited, and that the industry has barely scratched the surface. These applications do not necessarily require large furnaces. In many installations, the committee pointed out, a number of smaller furnaces can be used advantageously.

Peerless Electric

certified blower units built with job-matched Peerless motors

MORE PERFORMANCE

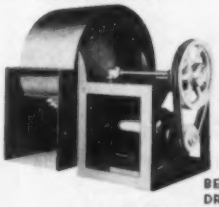


DIRECT DRIVE UTILITY BLOWER

LESS COST

PRESSURE BLOWER

LESS EFFORT



BELT DRIVE UTILITY BLOWER

● Smooth-running efficiency, compactly built around rugged all-metal frames . . . that spells Peerless ready-to-install blower units, built with job-matched Peerless motors.

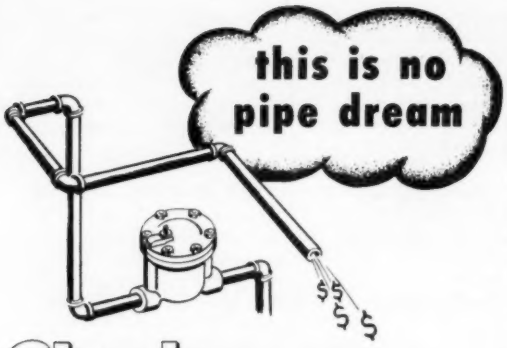
There's a certified Peerless Blower for your every requirement. Write today for complete catalog. Remember, Peerless offers you faster service, fuller guarantees, longer life. Get the full facts now; judge for yourself!

Fan and Blower Division

THE PEERLESS ELECTRIC COMPANY

1409 West Market St. • Warren, Ohio

Peerless Electric

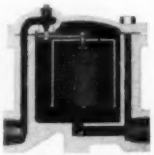


Clark CONTROLS
CAN SAVE YOU MONEY
All Down the Line:

If dollars are running through your steam lines it's time Clark Controls took over. Water in steam lines wastes fuel, cuts efficiency and adds greatly to maintenance costs.

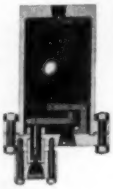
Clark Steam Traps, with Duo-Stop Leverage, drain *twice* the condensate of ordinary traps. Clark Controls on your lines is truly like money in the bank. Write us for full details.

QUICK CLEANING STRAINERS
Remove dirt, scale and grit from steam, fluid and gas lines. Sizes ½" to 3" P.S.I.



SERIES "70" Inverted Bucket Trap
One of the most popular in the Clark line. Continuous flow capacities up to 2600 lbs. per hour. Sizes ½", ¾" and 1". Pressures up to 200 P.S.I.

SERIES "60" Inverted Bucket Trap
Choice of horizontal or vertical inlet or outlet. For pressures up to 150 P.S.I. "Clark-loy" guided disc and seat.



SERIES "450"
For continuous flow drainage. Pressures up to 600 P.S.I. Sizes ½" to 2". External discharge valve; "Clark-loy" disc and seat.

THE Clark MANUFACTURING COMPANY
THE HOME OF DUO STEP LEVERAGE
1830 E. 38th St. • CLEVELAND 14, OHIO

JOSEPH A. GRAZIER has been elected executive vice president, *AMERICAN RADIATOR & STANDARD SANITARY CORP.*, Pittsburgh, and has been named to the board of directors and the executive committee. Formerly vice president and secretary, he succeeds the late *J. PHILLIPS COSGROVE* in all three positions. He is succeeded as secretary by *FRANK J. BERBERICH*, formerly assistant secretary. In addition, *W. WALTON WOODROOF* has been appointed a field sales engineer in the company's Engineered Products Div. He has been engaged in sales and engineering work for 25 years.

The new manager, Equipment and Process Sales Dept., *AIR REDUCTION CO.*, New York, is *DALE D. SPOOR*, former chief, Industries Branch, Metalworking Equipment Div., N.P.A. In 1951 he had been granted a leave of absence from the company to organize the N.P.A.'s Welding Equipment Section, Machinery Div.

MAJ. GEN. THOMAS F. FARRELL, assistant general manager for manufacturing, *U.S. ATOMIC ENERGY COMMISSION*, since August, 1951, has resigned to become managing director of *ARO, INC.*, which manages and operates the Arnold Engineering Development Center at Tullahoma, Tenn. He is succeeded by *WALTER J. WILLIAMS*, deputy general manager, who will retain this post as well. *JAMES L. KELEHAN*, formerly assistant director of production, is now assistant to Mr. Williams in both his functions.

THUR SCHMIDT has been appointed director of research and development, *INGERSOLL PRODUCTS DIV., BORG-WARNER CORP.*, Chicago. He was formerly assistant to the president.

The new sales promotion manager, *BRYANT HEATER DIV.*, Affiliated Gas Equipment, Inc., Cleveland, is *HARRY J. WINES*, who formerly managed distribution sales of cooling and heating products for General Electric Co.

HERBERT E. SMITH and *WILLIAM BYNUM* have been added to the board of directors, *CARRIER CORP.*, Syracuse, increasing the membership to 12. Mr. Smith is a director and member of the finance committee of United States Rubber Co. Mr. Bynum is executive vice president of Carrier.

At a recent annual meeting of the *MIDWEST STOKER ASS'N.*, Chicago, all officers and directors were re-elected for the ensuing year, as follows: president, *P. I. BOHMANN*, U. S. Machine Corp.; vice president, *E. J. WORLEY*, Worley Equipment, Inc.; secretary-treasurer, *E. M. MAY*, Steel Products Engineering Co. These three officers also were re-elected to the Board of Directors, along with *J. J. HAYES*, Auburn Stoker Co.; and *JOSEPH J. ZANG*, Herndon Sales & Service Co. The chairmen of the association's various standing committees also were re-appointed for the next full year term.

COMBUSTION ENGINEERING-SUPERHEATER, INC., New York, has elected *WILLIAM J. VOGEL* and *ROBERT M. HATFIELD* as vice presidents. Mr. Vogel,

with the company since 1924, will continue as chief engineer, a post to which he was appointed in 1950. Mr. Hatfield, who joined the company in 1934, will continue as manager of its western division.

Newly elected officers of the *CONVECTOR MANUFACTURERS ASS'N.*, chosen at a recent meeting in Louisville, are *W. R. McMAHON*, Modine Mfg. Co., president; *W. G. SCHLICHTING*, Young Radiator Co., vice president; and *R. O. REEVES*, Airtherm Mfg. Co., secretary. Mr. Schlichting is retiring president, and Mr. McMahon has been secretary.

COL. EDWARD J. McGREW, JR., who recently completed his assignment as assistant chief of staff of the 301st Logistical Command, has resumed his duties as chairman, *NEW YORK STATE BUILDING CODE COMMISSION*, a post he has held since 1949.

JOHN K. BEIDLER has been appointed general manager, Machinery Div., *DRAVO CORP.*, Pittsburgh, and has also been elected a director and vice president of *DRAVO-DOYLE CO.*, a subsidiary. He succeeds the late *WALTER P. BERG* in the divisional post.

L. E. THOMPSON, formerly manager of distribution sales, is now manager of marketing, Air Conditioning Div., *GENERAL ELECTRIC CO.*, Bloomfield, N.J. He joined the company in 1935.

THE HAYS CORP., Michigan City, Ind., has appointed *PHIL SPRAGUE, JR.*, as executive vice president. He is succeeded as advertising manager by *PAUL B. LeBOEUF*, formerly with A. O. Smith Corp.

Officers elected for the ensuing year at the 26th annual meeting of the *INDUSTRIAL UNIT HEATER ASS'N.* were *G. A. MATHIS*, The New York Blower Co., president; *J. C. PATTERSON*, Carrier Corp., vice president; and *L. O. MONROE*, secretary-treasurer.

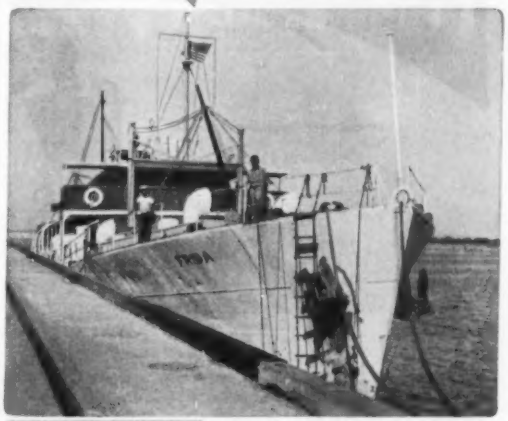
STEPHEN A. KELLER has been named general manager, Valve Div., *MINNEAPOLIS-HONEYWELL REGULATOR CO.*, Minneapolis. He succeeds *JAMES H. BINGER*, who will continue as vice president of the division. *HOWARD MacDONALD*, who has been chief industrial engineer, succeeds Mr. Keller as the division's plant superintendent, and *ROBERT W. DEVENPORT* becomes chief industrial engineer.

DR. FRED OLSEN is now vice president for research and development, *OLIN INDUSTRIES, INC.*, East Alton, Ill. He has been with the company since 1929.

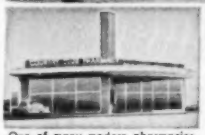
New members of the board of directors, *BUILDING CONSTRUCTION EMPLOYERS ASS'N. OF CHICAGO, INC.*, include *CHARLES E. CRONE*, Charles E. Crone Co., and *JOHN A. CORBOY*, M. J. Corboy Corp.

RICHARD M. BURBANK has been named assistant sales manager, Unit Ventilator Div., *HERMAN NELSON DIV., AMERICAN AIR FILTER CO., INC.*, Moline, Ill. He was formerly manager of the Boston branch office.

THEY SAY:
"There's nothing like This Air Conditioning"



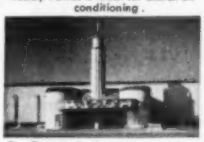
The "Frida," a banana boat plying between Mexico and Houston, Texas is Ready-Power equipped



One of many modern pharmacies that depend on Ready-Power.

More and more super markets are using Ready-Power.

Ready-Power is ideal for church air conditioning.



The Casa Linda theatre saves many dollars with Ready-Power.

Wherever used, Ready-Power has met the test of operating efficiency to the full satisfaction of the user.

Ready-Power air conditioning equipment is planned and designed to meet the most exacting requirements with the lowest possible operating costs.

Ready-Power design permits *continuous* operation at varying speeds, which is far superior to "on and off" types. This means that the air conditioning system performs at reduced capacity allowing for a constant dehumidification of the fresh air supply.

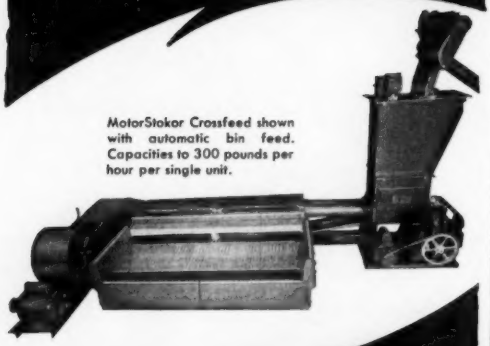
The dependable and economical performance of Ready-Power has been proved in hundreds of installations. Names of users will be furnished on request.

READY-POWER
SAVES AS IT SERVES

THE READY-POWER CO.
11231 FREUD AVE. • DETROIT 14, MICH.

Manufacturers of Gas and Diesel Engine Driven Generators and Air Conditioning Units; Gas and Diesel Electric Power Units for Industrial Trucks.

The Modern Answer to Commercial Heating... at low cost, without smoke!



MotorStokor Crossfeed shown with automatic bin feed. Capacities to 300 pounds per hour per single unit.

MOTOR STOKOR CROSSFEED
TRADE MARK

AUTOMATIC ANTHRACITE BURNER

Look at these outstanding features:

1. *No* moving parts in high temperature zone.
2. *Low* power requirements.
3. *Positive* over-load release.
4. *All* feed-rate adjustments made from the outside without disturbing fire.
5. *No* expensive boiler alterations required.
6. *Unusual* flexibility—may be mounted on either or both sides of boiler.
7. *Available* with hopper or automatic bin feed.
8. *Rapid* acceleration from bank to full output.
9. *Low* operating and maintenance costs.
10. *Efficiently* burns *low cost* rice or buckwheat anthracite.

Get the Facts NOW!

Write for your copy of the new 6-page booklet on the MotorStokor Crossfeed... it's free and full of detailed information.

MotorStokor Division
HERSHEY MACHINE & FOUNDRY COMPANY
524 Cherry St., Manheim, Pa.

JOHN G. MUIRHEID, mechanical engineer, *BUREAU OF SHIPS, NAVY DEPT.*, has been elected chairman, *DISTRICT OF COLUMBIA COUNCIL OF ENGINEERING AND ARCHITECTURAL SOCIETIES*. The council is composed of the local chapters of 25 national engineering societies and of the American Institute of Architects.

There have been a number of recent executive appointments at *WATSON-STILLMAN CO.*, Roselle, N.J. *R. S. SWEENEY*, vice president and treasurer, has been elected a director. *JAMES W. WEST, JR.*, a director, is now assistant to the president, and *A. B. DISS* is vice president in charge of manufacturing. *R. W. DINZL* is consulting engineer, *ADOLPH deMATTEO*, chief engineer. In the Hydraulic Div., *R. W. SCHRECK* is general manager of sales, *HERBERT E. ELLIOTT*, sales manager, and *A. WALTERS*, production manager. In the Distributor Products Div., *JACKSON KEMPER* is general manager of sales, and *JOHN P. BITTENBINDER* is sales manager. In addition, *WALTER R. BIEDERMANN* is industrial engineer, *ELSWORTH FALKENBERG* is plant manager, *ERIC NELSON* is plant superintendent, and *RICHARD M. NORMAN* has joined the hydraulic sales department.

MARTIN E. GILWOOD has been named director of research, *THE PERMUTIT CO.*, New York. Most recently, he has been manager of chemical research.

The new general sales manager, *QUAKER RUBBER CORP.*, division of H. K. Porter Co., Inc., Philadelphia, is *J. R. LEWIS*, who has been with the company more than 11 years, most recently as assistant general sales manager.

HARRY L. BRANSKY, Bransky Refrigeration Co., was elected president of the *REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASS'N. OF CHICAGO* at a recent annual meeting. *ALBERT G. WEIL*, Refrigeration Maintenance Corp., was elected vice president; and *WILLIAM L. WATSON*, Refrigeration Service Co., secretary-treasurer. The new directors are *MYER AXELROD*, Continental Refrigeration Service; *LEON EPSTEIN*, Reliable Refrigeration and Air Conditioning Corp.; *FRANK L. HAAS*, Haskris Co.; *E. S. McLEAN*, Merchants Commercial Refrigeration Engineering Sales Inc.; *HARVEY O. MILLER*, Murphy & Miller, Inc.; and *H. J. PREBENSEN*, Air Comfort Corp. The immediate past president is *GEORGE T. HOWE*, Accurate Electric Refrigeration Service, Inc.

REYNOLDS METALS CO., Louisville, has appointed *W. T. INGRAM* as general sales manager of the Pacific Coast region. He has been general manager of executive sales. In his new post, he succeeds *W. K. ALLEN FERGUSON*, who is now general director, pricing, general sales organization, with headquarters in Louisville.

THEODORE W. RUNDELL, formerly chief refrigeration engineer, Philco Corp., has been elected vice president in charge of engineering for *SERVEL, INC.*, Evansville, Ind. He succeeds *DR. WILLIAM R. HAINSWORTH*, who has been named staff consulting engineer to direct the company's long range engineering program in all fields. He will continue as a vice president. *JOHN H.*

JENNINGS, for the past seven years chief engineer of Mitchell Mfg. Co., is now chief engineer of Servel's room air conditioner division.

WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N.J., has elected *C. K. HOOD*, formerly manager of the New York district sales office, to a vice presidency. He will be responsible for the direction of the activities of the public works, steam power, deaerating, water treating, and steam turbine divisions, and will report to *T. CRUTHERS*, vice president.

JAMES E. HUMPHREYS, manager, Twinfuel Div., *NORMAN PRODUCTS CO.*, Columbus, Ohio, has also been placed in charge of advertising and sales promotion for the company's line of conversion burners, furnaces and overhead heaters. He joined the company last year.

JOHNS-MANVILLE CORP., New York, has appointed *MILES W. BURLESON* as assistant manager, Insulation Dept., Industrial Products Div. He has been with the company since 1936, most recently as a staff manager in the department.

Now director of engineering for *JACKSON & CHURCH CO.*, Saginaw, Mich., is *FRANCIS W. HOYE*, former head of the mechanical engineering departments at the University of Rhode Island and Syracuse University. *DR. HAROLD E. GRAVES*, who has been in charge of the chemical engineering department at the University of Rhode Island, will direct the company's chemical engineering.

GORDON F. MacFARLAND has been appointed to the newly created post of manager, refrigeration equipment sales, *DELCO PRODUCTS DIV., GENERAL MOTORS CORP.*, Dayton. He has had 25 years of experience in the refrigeration industry. *D. K. TIPPY*, who previously handled hermetic sales, will now devote his time to the division's defense projects.

R. W. STETSON, a marine engineering specialist formerly with Dowell, Inc., has joined the cathodic protection sales group, Magnesium Dept., *THE DOW CHEMICAL CO.*, Midland, Mich.

The new credit manager, *L. J. MUELLER FURNACE CO.*, Milwaukee, is *JOHN L. HUGHES*, formerly the claims adjuster for an insurance company. ..... *CHESTER A. SILVA*, formerly assistant auditor, *C. A. DUNHAM CO.*, Chicago, is now auditor.

IN THE TERRITORIES

For *HERMAN NELSON DIV., AMERICAN AIR FILTER CO., INC.*, Moline, Ill. — two new regional product application engineers for the Merchandised Products Div.: *FRANK T. CARROLL, JR.*, serving the east and west coast offices, and *HAROLD F. MEYER*, in the midwestern and southern offices.

For *WORTHINGTON PUMP AND MACHINERY CORP.*, Harrison, N.J. — *W. J. VAN VLECK*, now manager, Atlanta office, becomes manager, New York district

MUND BOILERS READY TO BE SHIPPED ANYWHERE...TODAY

Eliminate costly shut-downs, untimely delays. The vital steam power you need *today* can be shipped *today*! From strategically located, factory-equipped warehouses, MUND packaged-steam boilers are ready for shipment in a matter of hours. And MUND factory-trained service-jobbers assure quick installation and continuous operating efficiency.

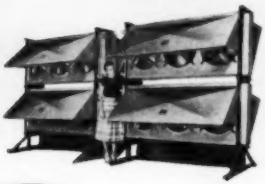
Keep your plant going *full steam ahead*. Trust MUND Boilers to deliver constant, uniform power. Efficient, compact, inclined water tube design provides many years of trouble-free service. Sizes 1½ to 350 H.P. Gas, oil or combination burners. A.S.M.E. approved. *Ready to be shipped anywhere TODAY.*

WRITE, PHONE, WIRE FOR SERVICE-JOBBER NEAREST YOU!

MUND Boilers, Inc.

1600 N. Indiana St., Los Angeles 63, Calif.

40 TON



20 TON

Cut out all **WATER** *problems*

WITH THE

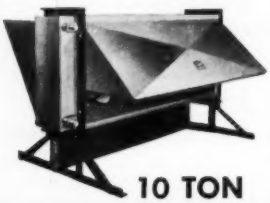
UNICON

by **KRAMER**

The UNICON eliminates all water problems . . . because it does not require any water. Any size compressor, regardless of tonnage, can be air-cooled with the UNICON by KRAMER. Stands, hood, and wind deflectors are available for simplified outside mounting of this Remote-Type Air-Cooled Condenser.

SPECIAL APPLICATIONS

Write to us about your condensing problem.



20 TON

WRITE FOR BULLETIN U-177-S

10 TON

KRAMER TRENTON CO.

Trenton 5, N.J.

sales office. *C. W. KRAMER*, salesman in Birmingham, succeeds him in Atlanta.

For *ALLOY STEEL PRODUCTS CO.*, Linden, N.J. — *WILLIAM P. SIMMONS*, representative for western territory covering California, Oregon, Washington, Idaho, Utah, Nevada, and Arizona. Headquarters — 24 California St., San Francisco. He will cooperate with Republic Supply Co. of California, authorized distributor for the company's valves.

For *BAKER REFRIGERATION CORP.*, South Windham, Me. — *WARREN S. FARNUM*, Cleveland district manager, formerly with Remington Corp. Mailing address — Box 5375, Cleveland.

For *BUSH MFG. CO.*, West Hartford, Conn., and *HEAT-X-CHANGER CO.*, Brewster, N.Y. — new sales and engineering offices and a new warehouse, 1490 Calzona St., Los Angeles. *HARRY L. QUINN* is west coast district manager. The new center has a railroad siding and a truck dock. It will serve California and surrounding states. The companies also have warehouse facilities in Seattle, to serve the northwest area, and plan to add representatives there and in San Francisco. The addition of the Los Angeles branch brings to 21 the number of sales and engineering offices.

For *C. A. DUNHAM CO.*, Chicago — *EDWIN L. DAVIS AND ASSOCIATES*, Tampa, Fla., representative for Florida and southern Georgia. Offices at 442 W. Lafayette St., Tampa, and 1506 Riverside Ave., Jacksonville.

For *CLEAVER-BROOKS CO.*, Milwaukee — two new representatives for boiler equipment: *E. C. GIBERSON*, 3719 Center St., Des Moines, for 29 counties in Iowa, four in Missouri and one in Illinois; *WILSON-WEESNER-WILKINSON CO.*, 310 South 2nd St., Nashville 6, for 37 counties in Tennessee and 26 in Kentucky.

For *REFRIGERATION DIV., CURTIS MFG. CO.*, St. Louis — *FRANK J. HANLEY*, regional manager in charge of Chicago offices, 9 S. Clinton St. He has been district sales manager in Cleveland.

For *DOLLINGER CORP.*, Rochester, N.Y. — two new district representatives: *SABEL E. BAUM*, Dixie Engineering Co., Birmingham, for Alabama, western Florida, and Marion, Hamilton, Bradley and Polk Counties, Tenn.; and *ROY A. STIPP*, Greenville, S.C., for North and South Carolina, and eastern Tennessee.

For *WOLVERINE TUBE DIV., CALUMET & HECLA CONSOLIDATED COPPER CO.*, Detroit — *J. A. JOLLY*, transferred from Milwaukee to Grand Rapids, where he will be responsible for sales in western and northern Michigan. *D. M. IRWIN*, now in charge of sales, Milwaukee area.

For *DURANT INTERNATIONAL CORP.*, Williamstown, N.J. — a number of new representatives: *CLARKE BARIDON, INC.*, Washington, D.C.; *VERNON TUPPER*,

JR., INC., Nashville; *INDUSTRIAL SALES, INC.*, Columbus, Ohio; *THE MUSSUN EQUIPMENT CO.*, Cleveland; *PLANNED AIR EQUIPMENT SALES, INC.*, Buffalo; and *THE SPURGEON CO.*, Detroit.

For *FASCO INDUSTRIES, INC.*, Rochester, N.Y. — *WILLIAM C. WATSON*, 2855 Connecticut Ave., Pittsburgh, representative in western Pennsylvania and West Virginia; *J. E. SHULL AND SON*, 350 South Central Ave., Los Angeles 13, representative for southern California, Arizona and southern Nevada.

For *INTERNATIONAL HEATER CO.*, Utica — *WILLIAM W. HUTCHINSON*, sales representative, Iowa, Missouri, eastern Nebraska, and eastern Kansas. He has been with the western office in Chicago.

For *MUCKLE MFG. CO.*, Owatonna, Minn. — two new representatives: *ROBERT PORTER*, 201 Magruder Bldg., Jackson 2, Miss., for Mississippi and Arkansas; and *HARRY A. ROPKE ASSOCIATES*, P.O. Box 25, Camp Taylor Station, Louisville 13, for Kentucky and Tennessee.

For *HAMMEL-DAHL CO.*, Providence, R.I. — *COWLES & CO.*, Dallas, sales and service representative in the central Texas area.

For *INLAND STEEL PRODUCTS CO.*, Milwaukee — *WILLIAM D. EPPERSON*, representative for steel building products in eastern Missouri and Arkansas. Headquarters will be the company's branch offices and warehouse in St. Louis.

For *RCA VICTOR DIV., RADIO CORP. OF AMERICA*, Camden, N.J. — four sales representatives for the new air conditioner line: *J. B. OGDEN*, in the central and west central regions, headquarters in the Chicago office; *TEMPLETON W. MARTIN*, in the southwest region, headquarters in Dallas; *H. M. MITTELHAUSER* for the eastern region — north from Washington, D.C. through the New England states, headquarters in New York; and *R. M. REED* for the southern region — south from Richmond to Miami, headquarters in Atlanta.

For *JACKSON & CHURCH CO.*, Saginaw, Mich. — *JOSEPH G. STALB*, factory representative, New York office. He is at 120 Wall St. Formerly, he was with Carrier Corp.

For *MITCHELL MFG. CO.*, Chicago — a number of new distributors for window type room air conditioners: *ALL STATE PIPE SUPPLY CO.*, 633 N. Myrtle Ave., Jacksonville 3, Fla.; *ARTCRAFT ELECTRIC SUPPLY CO.*, Calvert and Baptist Sts., Salisbury, Md.; *BIG BOYS*, Sunbury, Pa.; *CAPITAL LIGHT AND SUPPLY CO., INC.*, 6-8 Huntley Place, Hartford, Conn.; *CENTURY DISTRIBUTORS*, 318 N. Third St., Minneapolis; *COLORADO SPRINGS SUPPLY CO.*, 121 W. Cucharras, Colorado Springs; *CURREY'S WHOLESALE DISTRIBUTORS*, 109 16th Ave., South, Nashville 4; *ELECTRIC SALES & SERVICE CO.*, 209 Walton St., N.W., Atlanta 3; *ELECTRO-PLIANCE DISTRIBUTORS, INC.*, 2458

*and naturally they're using

STANDARD'S NEW

Perimeter Floor Register

with Standard's exclusive

DIALAMATIC CONTROL

*This is it!

Model No. PH-142

Works Better

Made Stronger

SPECIFICATIONS

The face and blades of model PH-142 are fabricated of 16 gauge steel, the blades are set in a fixed-fan angle degree for even deflection. The frame is of one piece, 18 gauge steel construction. The Louvre box fabricated of 16 gauge steel. Packed one to a box, and 20 to a master carton. Comes handsomely finished in gleaming, durable metallic-lustre.

For more information and Standard's New Pocket Catalog, attach this coupon to your business letterhead and mail to:

Standard Stamping & Perforating Co.

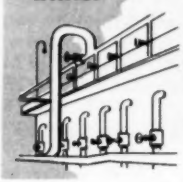
3151 WEST 49TH PLACE • CHICAGO 32, ILL.

NERVA-PLAST

COLD SETTING CEMENT

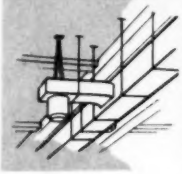
a completely waterproof, weatherproof, corrosion-resistant, flexible, applied coating

KEEPS INSULATION INTACT



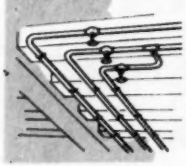
Prevents deterioration of porous heat insulating materials and pipe covering on outside lines and equipment above and below ground.

PROTECTS DUCTS AGAINST INSIDE CORROSION



When applied directly to inside of ducts, Nerva-Plast forms a protective coating against condensation, corrosive gases and moisture.

PREVENTS CONDENSATION



. . . where applied directly on cold water lines in textile and other industrial plants requiring a high degree of humidification.

Resists effectively the deleterious action of acids, alkalies, Portland cement, and sub-zero temperatures

•

Bonds readily and efficiently to all types of heat insulation materials, metals, asphalted felts and concrete

•

Nerva-Plast is easily and economically applied. Can be brushed, sprayed or trowelled on. Will take aluminum paint easily.

Mail coupon for additional information

RUBBER & PLASTICS COMPOUND CO., INC. 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

SEE OUR CATALOG IN SWEET'S

Please send me information on Nerva-Plast for use on .....

Name.....

Company.....

Street.....

City.....Zone.....State.....

W. Lisbon Ave., Milwaukee; *FALLS CITY SUPPLY CO.*, 315 Roland St., Louisville; *FOSTER-THORNBURG HARDWARE CO.*, Huntington, W. Va.; *FRAKER HEATING & EQUIPMENT CO.*, 1313 Grand Ave., Knoxville, Tenn.; *HAWKEYE SALES CO.*, 1220 Grand Ave., Des Moines; *KINGSPORT ELECTRIC CO.*, Box 29, Kingsport, Tenn. and *GEORGE H. LEHLEITNER CO.*, 4641 S. Carrollton St., New Orleans.

For *KRITZER RADIANT COILS, INC.*, Chicago — two new sales agents: *R. M. SCOTT*, 323 10th St., San Francisco, for the northern half of California; and *THE FISHER-LANHAM CO. INC.*, 2006 "K" St., N.W., Washington, D.C., for eastern Maryland, the District of Columbia, and the northern part of Virginia.

For *MODINE MFG. CO.*, Racine, Wis. — *W. J. SOMMERS CO.*, 505 Delaware Ave., Buffalo, new representative in the Buffalo territory, replacing the late *WALTER E. VOISINET*.

For *L. J. MUELLER FURNACE CO.*, Milwaukee — *R. C. DREW*, representative for southern Michigan and the northern parts of Indiana and Ohio.

For *LYNCH CORP.*, Anderson, Ind. — sales offices and warehouses have been opened in New York and Atlanta. Similar facilities have been scheduled for Chicago.

For *RELIANCE ELECTRIC & ENGINEERING CO.*, Cleveland — two district sales offices moved to new and larger quarters: Detroit office (including warehouse space) now at 12326 Hamilton Ave.; Cleveland office at 13967 Cedar Rd.

For *REMINGTON AIR CONDITIONING DIV., REMINGTON CORP.*, Auburn, N.Y. — *J. L. PERRY CO., INC.*, 815 N. 9th Ave., Nashville, distributor for mid-Tennessee and south Kentucky areas.

For *REVERE COPPER AND BRASS INC.*, New York — *PAUL H. WOLFE*, district manager, Atlanta, succeeding *R. M. BARKSDALE*, who asked to be relieved. Mr. Barksdale will continue to act as a company representative in the area.

For *PITTSBURGH LECTRODRYER CORP.*, Pittsburgh — *RALPH C. THOMAS*, president, *RALPH-CHARLES-THOMAS CO.*, Norfolk, now representative covering Virginia, except for Washington County; *D. W. CAPSTICK*, named St. Louis representative, also to cover southern half of Illinois and Evansville, Ind. He has been a manufacturers' agent in St. Louis since 1944.

For *GENERAL CONTROLS CO.*, Glendale, Calif. — *WILLIAM M. ROECKER*, with the company since 1947, now manager, Cleveland branch office.

For *INDUSTRIAL FREEZER DIV., WEBBER APPLIANCE CO., INC.*, Indianapolis — *ENGLISH AND MILLER MACHINE CO.*, 6560 Epworth Blvd., Detroit 10, distributor in eastern Michigan and the Detroit area.

For *INSUL-MASTIC CORP. OF AMERICA*, Pittsburgh — *HENRY P. BERRY*, southern regional manager, with headquarters in New Orleans.

For *UNITED STATES AIR CONDITIONING CORP.*, Minneapolis — *THE LUZERNE & LACKAWANNA SUPPLY CO.*, Wilkes-Barre, Pa., representative to handle the complete line. Offices and showroom are at 20-22 N. Pennsylvania Ave., showroom and warehouse at 15-23 N. State St., and warehouse at 14-16 N. Harrison St.

For *UNISTRUT PRODUCTS CO.*, Chicago — *D. A. BROWNLIE*, western district manager, supervising sales and distribution in California, Arizona, Oregon, Washington, Utah, Nevada, Idaho and the territory of Alaska. His headquarters will be in San Francisco.

For *J. O. ROSS ENGINEERING CORP.*, New York — *HOWARD McCALL* has joined the New York office. He has been a sales engineer in the southeast for Sturtevant Div., Westinghouse Electric Corp.

For *YORK CORP.*, York, Pa. — *ROGER L. SAMUELSEN*, now order administrator for the southwest district, with headquarters in Houston. He succeeds *GEORGE HAUGER*, who recently resigned.

For *REYNOLDS METALS CO.*, Louisville — *HAYDEN CLEMENT*, sales manager of packaging markets for the Pacific coast region, has been transferred from San Francisco to the Los Angeles office.

For *KENNARD CORP.*, St. Louis—*WILLIAM H. DUDLEY, JR.*, New Orleans sales representative.

For *BAILEY METER CO.*, Cleveland—*W. POWELL, JR.*, manager, Buffalo branch office, 705 Ellicott Sq. Bldg., succeeding *H. T. SAWYER*, who resigned to accept a post with Radio Corp. of America.

For *THE OHIO INJECTOR CO.*, Wadsworth, Ohio—*D. A. HERRICK*, Cleveland divisional sales manager, succeeding *W. G. SHEPHARD*, now supervising the central division from Chicago headquarters. The Cleveland division covers Ohio and extends to Buffalo and Pittsburgh.

For *THE PERMUTIT CO.*, New York—*R. B. BRUNS*, district engineer, Philadelphia office, succeeding *D. J. HESS*, retiring, who will continue with the company in an advisory capacity through June. *M. BLUNDON* is district engineer, Decatur, Ill., office, succeeding Mr. Bruns.

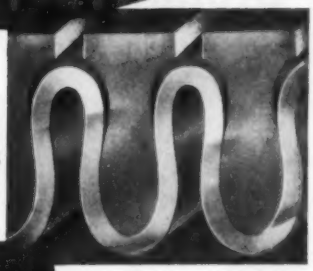
For *THE BRUNER CORP.*, Milwaukee—three district sales representatives for "Supreme" water softening equipment: *EARL F. STOCKER*, covering Iowa territory, except for Keokuk and Rock Island, Ill., headquarters, 1433 22nd St., Des Moines; *CARL C. FIELDING*, for Utah and Montana, headquarters, Builders' Mart, 916 South Main St., Salt Lake City; *RAYMOND ABRAMS*, for southern California, Arizona and Las Vegas, headquarters, 1120 South Santa Fe Ave., Los Angeles.

For *DE LAVAL TURBINE PACIFIC CO.*, San Francisco (new subsidiary of De Laval Steam Turbine Co., Trenton, N.J.)—branch sales offices are in Los Angeles, *H. H. REYNOLDS* district manager; and Seattle, Wash., *J. A. GREENLAND* district manager.

a *Basic Principle* for protection

developed to ultimate efficiency

in Badger Expansion Joints

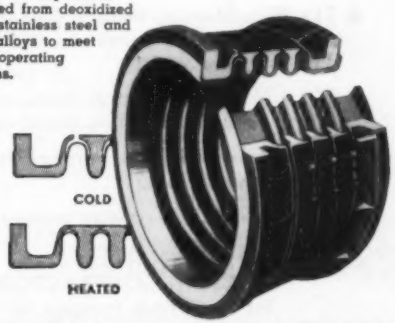


Directed-Flexing . . . Self-Equalizing . . . exclusive features of Badger Expansion Joints

Badger Manufacturing Company developed its *Directed-Flexing, Self-Equalizing* expansion joints with lasting protection to costly equipment in mind. The all-curve pattern of the corrugated member eliminates sharp bends and structure weakening stresses which assure long maintenance-free life.

In combination with the correspondingly shaped Badger Self-Equalizing ring, progressively controlled movement of *each* corrugation insures a more flexible, longer lasting joint. Buy Badger Joints and you get flexibility, Directed-Flexing Self-Equalizing and these features:

- Packless . . . pressure-tight single tube—requires no maintenance
- Compact . . . approximately the size of flanged fitting
- Special forming . . . no structure-weakening stresses
- Controlled heat treating . . . assures long life
- Wide range of traverse — pressure — temperature Fabricated from deoxidized copper, stainless steel and special alloys to meet various operating conditions.



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Original and Sole Manufacturer of Badger Expansion Joints

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McKee
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"Steamboilerplants"

OFFER all this EXTRA VALUE

Instead of skimping, Eclipse goes "all out" to give more at every point—

- 71% More Heating Surface than on comparable boilers. This means higher combustion efficiency; longer life.
- 321% More Combustion Space—lower firing temperature for more effective heating.
- 13% More Steam Disengagement—produces Dryer Steam.
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HEATING CONTRACTORS—Write for the Eclipse Program for YOU.

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NEW BOOKS & REPORTS

Ratings for Baseboards and Cast Iron Boilers

For the first time, approved IBR ratings for baseboards are combined with IBR ratings for boilers in one booklet, *IBR Ratings for Cast Iron Boilers and for Baseboards of All Types*, published by The Institute of Boiler and Radiator Manufacturers. The ratings are approved by the institute after tests conducted by the various manufacturers under terms of the IBR testing and rating code. The booklet is designed for contractors, architects, engineers, and others concerned with the specifications, design, sale, and installation of hot water and steam heating systems.

This 68 page publication is available from the institute, 60 E. 42nd St., New York 17, at 75 cents a copy.

Warm Air Perimeter Heating

A new edition of booklet No. 4 on warm air perimeter heating has been published by the National Warm Air Heating and Air Conditioning Association. The design and installation recommendations result from research sponsored by the association at the University of Illinois, and from its field investigation program.

A general discussion of warm air perimeter heating, site selection, and performance characteristics is followed by a section on structures built on concrete slabs (including coverage of the perimeter loop, radial, and lateral systems). The section on structures built over crawl spaces covers three variations of crawl space duct systems and the crawl space plenum system which uses the space under the structure as a warm air supply chamber. There are suggestions for using several types of duct materials, including sheet metal, fiber tubing, vitrified clay pipe and cast concrete forms. For basementless structures, the discussion covers selection and installation of the furnace unit, temperature control equipment, etc. Six separate worksheets, providing space for heat loss calculation and selection of equipment, and containing design instructions, etc., are offered.

The first edition of the manual limited the heat loss of a structure with perimeter heating to 60,000 Btu. However, this limitation has been raised. One of the worksheets, Form 41-B, outlines design methods for perimeter loop systems installed in concrete slabs for structures having a heat loss up to 100,000 Btu per hr. For buildings having a greater heat loss, the form recommends that two or more furnaces be used, each with a separate perimeter system. One advantage is that multiple furnaces, individually controlled, provide zone heat distribution.

Copies of the manual, with samples of the worksheets, are available from the association, 145 Public Square, Cleveland 14, at $1.00 per copy, postpaid, 60 cents to members.

Corrosion Testing

The 1951 ASTM Edgar Marburg lecture, *Corrosion Testing*, given by Francis L. LaQue, International Nickel Co., Inc., has been published in booklet form. The lecture comprises a survey of corrosion testing programs, and methods of corrosion testing, many of which have been sponsored by the American Society for Testing Materials.

The author discusses the distinction that must be made between the corrodibility of a material and the protective value of its corrosion products, and how these are influenced by both the composition of the material and the incidental conditions of its exposure. Topics covered include atmospheric corrosion studies, relations between rust color and corrosion, effects of alloying elements on the corrosion resistance of steels and irons, comparison of atmospheres, and galvanic corrosion. A variety of tests (acid, salt spray, etc.) also are discussed.

Copies of the 96 page booklet are available from the publisher, the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $1.50 each.

Insulating Buildings For Various Climates

In the field of building insulation practices, much new knowledge is in the form of research papers which are often either too technical or too limited in scope to be of use to practical engineers, architects, and others.

In *Design of Insulated Buildings for Various Climates*, the author, Tyler S. Rogers, Owens-Corning Fiberglas Corp., aims at a distillation of the established technical knowledge in the field, presented in easily understandable form. Illustrations have been used extensively to explain how climate, the sources and movement of heat, the sources and behavior of moisture, and the use of structural ventilation, all have a practical bearing on good building design. These topics comprise the first part of the book, dealing with principles.

The second part, on practices, includes a number of tables for use in design calculation for buildings of various types and sizes — ranging from small to multistory. Summer and winter comfort ratings indicate the degree of comfort each construction may be expected to provide; economy ratings show savings in heating cost for insulated vs. uninsulated construction; and occupancy-moisture ratings show what relative humidity levels can be maintained in different climates without fear that hidden condensation will develop. Covered is design of insulated roof or ceilings, and of insulated walls and floors.

The author has been assisted by Dr. Paul A. Siple, Department of the Army, General Staff; Professor Elmer Queer, State College, Pa., H. T. Fisher, A. I. A.; and J. H. Callender, A. I. A.

The 119 page book may be obtained from the publisher, Architectural Record, F. W. Dodge Corp., 119 West 40th Street, New York 18, at $5.50 a copy.

Disposal of Various Radioactive Wastes

With the increasing use of radioactive isotopes by industry, the medical profession, and research laboratories, certain minimal precautions must be taken to protect the users and the public. In *Recommendations for Waste Disposal of Phosphorus-32 and Iodine-131 for Medical Users*, prepared by the National Committee on Radiation Protection, it is assumed that disposal of the greater part of these isotopes will be by sewer. Therefore, the report considers permissible concentrations from the point of view of safety to the general community and, especially, to sanitation workers and sewage plant personnel. Recommendations are believed to represent the best opinions now available, but the organization's subcommittee on waste disposal and decontamination is carrying on further work in the field. Since the disposal of radioactive waste varies

TVC
LOW PRESSURE SYSTEM
Condensate Pumps

Low Return Connection
Low Speed, Long Life
Cast Iron Receiver
Low Water Line
Single or Duplex

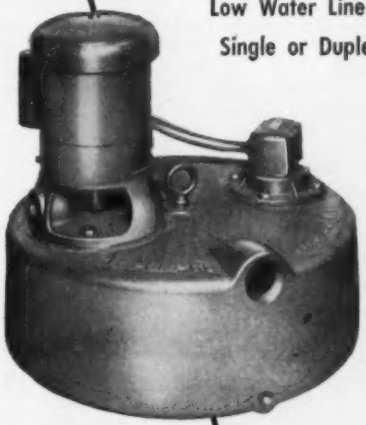

Fig. TVC 118
Single TVC unit

Capacities from
500 to 10,000 Sq. Ft. E.D.R.

Ask for
Bulletin TVC 300

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over wide limits, depending upon the use to which the isotopes are put, the committee has decided to issue a series of individual reports (such as this one) dealing with particular conditions.

The report (National Bureau of Standards Handbook 49, iv, 11 pages) may be ordered from the Government Printing Office, Washington 25, D. C., at 10 cents a copy.

Heat Transfer between Industrial Fluids

Industrial Heat Transfer, by F. W. Hutchinson, University of California, is designed to simplify the solution of complex formulas necessary in the solving of heat transfer problems. It also aids in determining the viscosity, specific heat, and density of the fluids. Included are 128 working charts, from which a direct solution of these problems can be obtained for 70 industrial fluids, ranging from air and acetylene to sulfur dioxide and water. The page opposite each graph gives the equation for it, its limitations, its extension, and the references to the discussion of that equation in the text. Examples are given for which solutions are shown on the graph.

Chapters cover conduction, radiation, convection, combined heat transfer, and forced convection (of gases and liquids, whether heating or cooling, within or outside of pipes).

This 336 page book is available from the publisher, The Industrial Press, 148 Lafayette St., New York 13, at $6.00 a copy.

Nomography and Empirical Equations

The purpose of *Nomography and Empirical Equations*, by Lee H. Johnson, Tulane University, is to explain two useful techniques for handling data gathered from experiments, from routine manufacturing operations, etc. They are nomographs, which provide quick graphical answers where numerical data are substituted into formulas, and empirical equations, which are the mathematical expressions of data plotted in the form of curves.

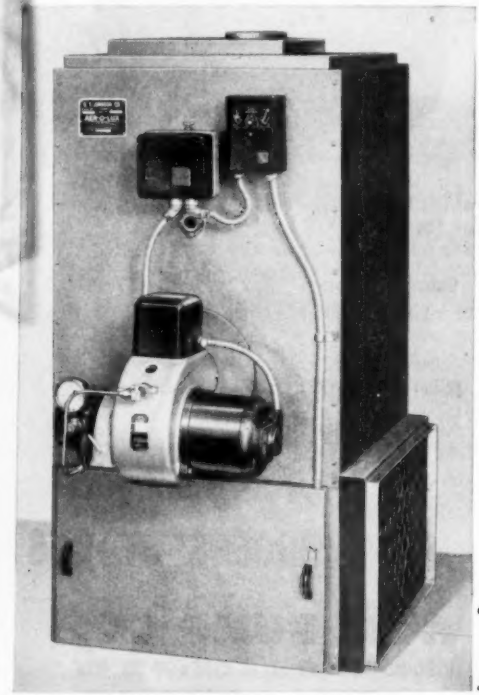
The introduction to the nomography section covers scales in general, scale modulus, first steps in plotting scales, etc. Then follow chapters on parallel scale nomographs, Z-charts, parallel and perpendicular index lines, concurrent scales, etc. The second section, on equations, discusses methods of curve fitting, and curves of two, three and four constants.

This 150 page book is available from the publisher, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, at $3.75 a copy.

OTHER BOOKS AND REPORTS RECEIVED

SIX STEPS IN SELLING TO THE ARMED SERVICES, published by the Department of Manufacture, Chamber of Commerce of the United States, offers the following suggestions to firms desiring defense contracts and subcontracts: know government buying procedures; make your plant capabilities known; find the right buying office; sell as strongly as in commercial practice; seek subcontracts as well as prime; know when to visit Washington — when not to.

This 11 page booklet is available from the department, Washington 6, D. C., at 15 cents a copy (quantity prices furnished on request).



Another "Winner" in the line-up of Johnson Burners!

AEROLUX 65-U

. . . a super-efficient new oil-fired **WARM AIR HEATER**

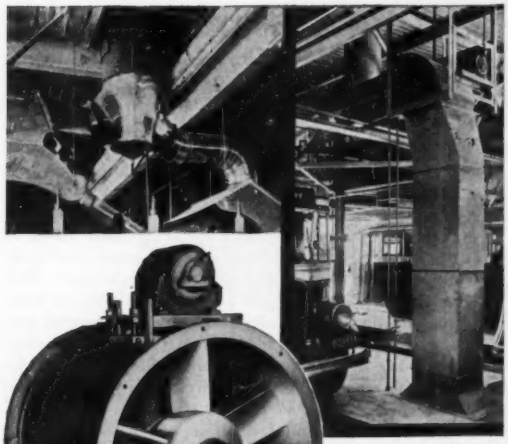
This new model of Johnson's Aerolux will do an exceptionally economical job of heating homes and buildings having a heat loss of 50,000 to 65,000 BTU per hour. It is powered by the famous Johnson Bankheat Burner . . . one of the most efficient pressure-atomizing-type burners ever manufactured. Operation is completely automatic.

For installation in close quarters (even in a closet on the main floor) the Aerolux 65-U is exceptionally adaptable as it measures only 25" square on the floor and 52" high. It is listed by Underwriters Laboratories for Less than Standard Clearances and carries Commercial Standards Label CS-75. To reduce installation costs the Aerolux 65-U is completely assembled with all controls in place before shipping.

The Aerolux 65-U will be on display with other Johnson Burners in our exhibit in Booths 1049 and 1051 at the Philadelphia Exposition. We cordially invite you to inspect it there . . . or see it at your nearest Johnson Dealer.

.....Johnson Oil Burners....

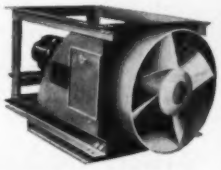
S. T. JOHNSON CO.
940 Arlington Ave., Oakland 8, Calif.
401 No. Broad St., Philadelphia 8, Pa.



Upper left: Wingfoil Straight-Line Duct Fan in Textile Mill. Upper right: Wingfoil Elbow Type Duct Fan exhausting gases in a Garage.

Wingfoil Straight-Line Duct Fan

Wingfoil Elbow Type Duct Fan



WINGFOIL DUCT FANS DELIVER LARGE AIR VOLUMES with Low Power Consumption . . .

The Wingfoil Axial Flow Duct Fan, in either elbow type or straight line type, is a compact, economical fan designed to operate against static pressure. Both types have the motor outside the casing, unaffected by hot or dirty gases. Light weight, compact, easily handled, they may be inserted into a line of duct, either as an elbow or a straight section.

Write for Bulletin F-10

L. J. Wing Mfg. Co. 140 Vreeland Mills Rd. Linden, New Jersey

Factories: Linden, N. J., Montreal, Canada

Wing AXIAL FLOW DUCT FANS

This Trap Makes a Habit of Real Thrift

Built to last, a B&J Trap is a miser on maintenance. The cage unit is a complete operating unit in itself, containing the thermostatic element, valve piece and trap seat accurately calibrated in exactly correct relation to each other before it leaves our factory . . . and locked in permanent, unalterable adjustment. This reflects in real savings on repair and maintenance problems after installation.

Yes, when you select Barnes & Jones heating specialties in the beginning, you never have regrets in the end!

BARNES & JONES, Inc.

128 BROOKSIDE AVENUE, BOSTON 30, MASS.

Representatives in all principal cities

Effective *quiet* duct exhaust with Swartwout Airlift

Centrifugal Fan Type Ventilator

Here's measurable *effective* exhaust capacity at very low noise levels! Quietness alone in duct exhausters isn't enough; you want the capacity needed for the job without wasteful size and cost. Airlift ventilator design features a streamlined fan inlet and oversize outlet opening. Turbulence and friction losses are cut to the minimum. It is often possible to use a smaller size Airlift than ordinarily specified because of the efficiency of both ventilator design and centrifugal fan wheel. The low tip speed of the fan assures quiet operation.

Capacities of the 14 larger Airlift sizes (top illustration) range from 1350 to 32,000 C.F.M.; for Airlift Jr, (left) from 280 to 895 C.F.M. in 4 sizes. Write for Bulletin 341 F.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Roof Ventilators and Ventilating Louvers

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS

MEETINGS & CONVENTIONS

OIL-HEAT INSTITUTE OF AMERICA, INC., 6 E. 39th St., New York 16—29th anniversary exhibition of the automatic oil-heat industry, April 14 to 18, Commercial Museum, Philadelphia. To be held concurrently with the annual convention, which will be headquartered at the Benjamin Franklin Hotel. There will be a program by the technical division on Tuesday morning April 15 (Engineering Day), for people at the technical level in oil refining and oil burner manufacturer organizations. That afternoon, five papers will be presented which are of interest to manufacturers, dealers and others concerned with new developments in the field. W. S. Quinby will conduct the morning session, and Nat Hunter, the afternoon. On Wednesday morning (Industry Day) there will be a panel session covering such subjects as availability of automatic heating equipment and fuel oil supply, news on government programs, and marketing and sales. That afternoon, the commercial-industrial committee will meet for lunch and hold its main session starting at 2:00. Cy Burg will chairman the meeting, which is open to all interested in the field.

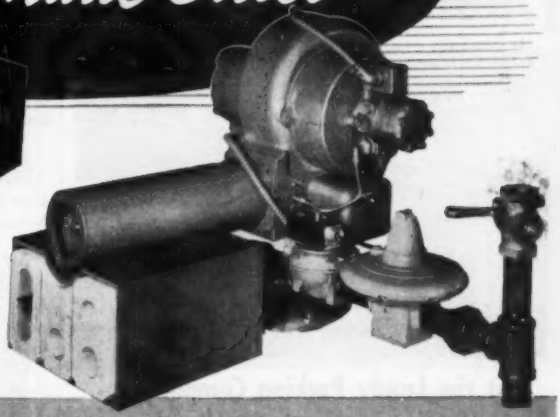
IBR SCHOOL OF MODERN HEATING—April 16 to 18, Baltimore; April 22 to 24, Greensboro, N. C.; April 29 to May 1, Charlotte, N. C.; May 6 to 8, Birmingham, Ala. Sponsored by The Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17. The school is a three day course providing instruction in the design and installation of hot water and steam heating systems. A complete list of meetings scheduled through June is available from the institute.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS, 1941 Grand Central Terminal, New York 17—Annual convention and exposition, May 1 to 3, Hotel New Yorker, New York. For information on exhibition space, write A. A. Lorie, Frederic R. Harris, Inc., 27 William St., New York 5.

1952 INTERNATIONAL FOUNDRY CONGRESS AND SHOW—May 1 to 7, Convention Hall, Atlantic City. Host this year, the American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5. The congresses are scheduled by the International Committee of Foundry Technical Associations, representing 12 countries. There will be a session on safety and hygiene and air pollution (non-ferrous), 4:00 p.m., May 3; on safety and hygiene, 10:00 a.m., May 5; and on safety and hygiene and air pollution (ferrous), 2:00 p.m., May 5.

SECOND NATIONAL AIR POLLUTION SYMPOSIUM—May 5 and 6, Huntington Hotel, Pasadena, Calif. Sponsored by Stanford Research Institute, in cooperation with California Institute of Technology, the University of California at Los Angeles, and the University of Southern California. The program will cover new techniques in sampling, analysis and instrumentation, fundamental chemistry and physics of the atmosphere, etc. For information write symposium headquarters, Room 332, 612 South Flower St., Los Angeles.

Get the COMBI-MATIC for *Automatic Sales*



• The NEW G-3A Burner (illustrated here) is versatile in application and can be used for a multitude of installations as a straight gas burner or a combination gas and oil burner. The "COMBI-MATIC" will switch from gas to oil, either from a pre-determined setting of an outside thermostat or by manual control providing an uninterrupted fuel supply.

Siemon Combi-Matic BURNER
COMBINES OIL AND GAS
TRADE MARK REG U S PAT OFF

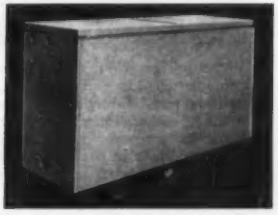
ECONOMICAL • DEPENDABLE • COMPLETELY *Automatic Heat*

Write for Literature **SIEMON and CO.**

1819 HOLMES • KANSAS CITY, MO.

Vary Your Temperature *to Suit Room Needs*

AIR CONDITION *with* . . . DOLE *Ice-Cels*

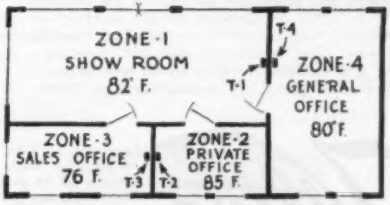


If your building is composed of both large and small rooms or zones, each zone requiring a different temperature or variable temperatures, DOLE Ice-Cels will provide ideal air conditioning. An office can be cooled after business hours without air conditioning the entire floor or building and rooms kept at different temperatures to suit the occupant.

For complete data on DOLE Ice-Cels, ask for Catalog.

DOC DOLECO Says—

25 years of specialization in plate refrigeration have made DOLE the leader, often imitated but NEVER equalled.



4 ZONES - 4 PUMPS - 4 THERMOSTATS

DOLE Vacuum COLD PLATES

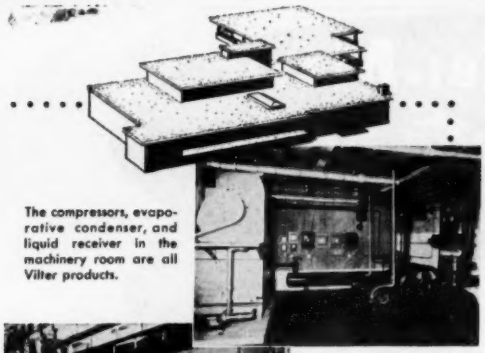
DOLE REFRIGERATING COMPANY

5918 N. PULASKI RD., CHICAGO 30, ILL.

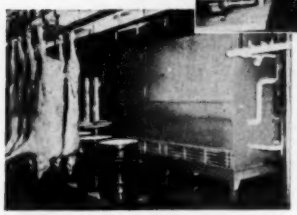
103 Park Ave., New York 17

In Canada: Dole Refrigerating Products Limited, 44 Elgin Street, Brantford, Ontario.

25th Anniversary



The compressors, evaporative condenser, and liquid receiver in the machinery room are all Vilter products.



Vilter Brine Spray units cool the Lundy chilling and holding rooms. Automatic controls for both moisture and humidity are used here.

at the Lundy Packing Company of Clinton, North Carolina

it's VILTER again

● The Lundy Packing Company was established in 1950 both to provide a new industry for Clinton, and to promote the raising of livestock throughout eastern North Carolina. At the present time, the Lundy plant processes hogs, and produces lard and other by-products.

Vilter refrigeration in the Lundy plant provides cooling and humidity control for the chilling and holding rooms, and cools a direct expansion lard roll. Operation of the Vilter compressors is automatic. The proximity of the Vilter Evaporative Condenser to the compressors adds to the savings of this thrifty Vilter unit.

Packers and processors throughout the country rely on Vilter refrigeration for the carefully controlled, fully dependable cooling they must have. Because Vilter equipment adds low operating cost and minimum upkeep to its reliability, plant after plant has standardized on Vilter.

Vilter

Your nearby Vilter Distributor or Representative will be glad to show you how you can save with Vilter.

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY
MILWAUKEE 7, WISCONSIN
Ammonia and Freon Compressors • Pakicers • Evaporative and Shell & Tube Condensers • Pipe Coils • Valves and Fittings • Air Conditioning

SHEET METAL CONTRACTOR'S NATIONAL ASSOCIATION, 170 Division St., Elgin, Ill.—Annual convention, May 12 to 14, Rochester, N.Y. For further information, contact publicity committee chairman, Irving G. Spalty, 546 Jefferson Ave., Rochester 11.

INTERNATIONAL CHURCHMAN'S EXPOSITION—May 19 to 24, Chicago International Amphitheatre. Exposition managers, M. W. Hinson and J. Vancil, 19 S. LaSalle St., Chicago 3. Purpose of exposition, to aid in the planning, construction, maintenance and more effective use of church property.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 40 W. 40th St., New York 18—Next meeting, June 1 to 4, Biltmore Hotel, Atlanta. 38th annual meeting, November 30 to December 3, Hotel Commodore, New York.

NATIONAL DISTRICT HEATING ASSOCIATION, 827 N. Euclid Ave., Pittsburgh 6—43rd annual meeting, June 3 to 6, Skytop Club, Skytop, Pa.

HEATING, PIPING & AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, Suite 1401, Rockefeller Center, 1250 Avenue of the Americas, New York 20 — 63rd annual convention, June 10 to 13, Hotel Statler, Boston.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 62 Worth St., New York 13—Semi-annual meeting, June 16 to 18, The Essex and Sussex, Spring Lake, N.J.

STOKER MANUFACTURERS' ASSOCIATION, 307 N. Michigan Ave., Chicago 1—1952 annual meeting, June 23 and 24, South Shore Inn, Lake Wawasee, near Syracuse, Ind. There will be committee meetings, June 22.

AMERICAN SOCIETY FOR TESTING MATERIALS, 1916 Race St., Philadelphia 3—50th anniversary meeting, June 23 to 27, Hotels Statler and New Yorker, New York.

INSTRUMENT SOCIETY OF AMERICA, 921 Ridge Ave., Pittsburgh 12. National Instrument Conference and Exhibit, September 8 to 12, Cleveland.

SEVENTH NATIONAL CHEMICAL EXPOSITION—September 9 to 13, Coliseum, Chicago. Sponsored by the Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1.

AMERICAN INSTITUTE OF WHOLESALE PLUMBING AND HEATING SUPPLY ASSOCIATIONS, INC.—First national convention, October 19 to 22, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. For further information write G. T. Underwood, executive secretary, Room 402, Albee Bldg., 15th and G Sts., Washington, D.C.

11th INTERNATIONAL HEATING & VENTILATING EXPOSITION — THE AIR CONDITIONING EXPOSITION — January 26 to 30, 1953, International Amphitheatre, Chicago. Held under the auspices of The American Society of Heating and Ventilating Engineers. Address inquiries to the exposition management, International Exposition Co., Inc., Grand Central Palace, New York 17.

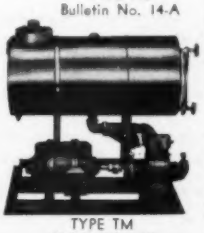
We have quite a following too—

TYPE UV
Bulletin No. 19-A

SKIDMORE'S following of satisfied customers has grown steadily in the past 30 years.

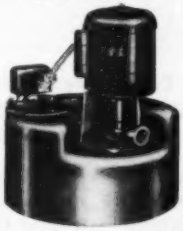
In hotels, hospitals, laundries, industrial and institutional projects throughout the country, wherever specific requirements call for a heating pump, there, you will find a Skidmore Pump giving years of dependable service . . . this kind of outstanding performance with the minimum amount of upkeep increases the Skidmore Pump following, making it today's most popular heating pump.

TYPE HS
Bulletin No. 14-A



TYPE TM
Bulletin No. 17

For complete story on these and other type pumps, send for your Skidmore Pump bulletins today.



TYPE CV
Bulletin No. 21

SKIDMORE PUMPS

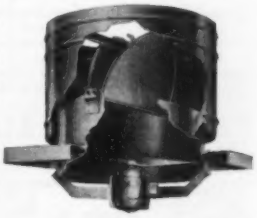
St. Joseph, Michigan

Clear the air for plant efficiency

Sky-Blast expels heat, dust, fumes, smoke

POSITIVELY, ECONOMICALLY

Leading companies have found Sky-Blast Power Roof Ventilator the most practical, most economical solution to many air moving problems. Twenty years of development and improvement of the original vertical roof ventilator gives you these advantages:



It's Powerful – High velocity discharge of the Sky-Blast is unaffected by winds. Heat, smoke, dust and fumes are carried high into the outside air.

It's Positive–Strong exhaust and powerful suction result from the exceptionally good pressure characteristics of the cast aluminum airfoil propeller. Circular construction of the wind guard plus the advantage of vertical discharge guarantees constant performance, regardless of wind direction and velocity.

It's Streamlined – Low silhouette, symmetrical from all angles, reduces resistance to wind; minimizes roof stresses. Automatic butterfly dampers will not leak; rainshed will not clog.

It's Economical – Sky-Blast ventilation is low in first cost, low in installation cost, low in maintenance and operating costs. Weather-resistant R&M motor is designed for continuous operation under adverse conditions. Heavy-gauge curb base is easily mounted, assures lifetime support.

Propellair has a ventilation solution for almost every industrial need. Qualified engineers are available for consultation without obligation.

Write for Catalog H-680.

PROPELLAIR®

SKY-BLAST®

POWER ROOF VENTILATOR

PROPELLAIR DIV., ROBBINS & MYERS, INC., SPRINGFIELD, OHIO

RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 203. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending requests to Heating, Piping & Air Conditioning.

Adjustable Air Diffusers

HPAC 101—Bulletin K-20-A covers "Kno-Draft" adjustable air diffusers, and contains a number of revisions and additions, including temperature differential and mounting height scales — W. B. Connor Engineering Corp., Shelter Rock Lane, Danbury, Conn. It includes "throw" formulas to determine terminal velocities other than standard, expanded selection curves, air entrainment ratios, static pressure and resistance charts, and simplified balancing and testing data.

Air Conditioning Cabinets

HPAC 102—Bulletin 3703-A covers Model G air conditioning cabinets, manufactured in both the horizontal and vertical units, in sizes from 875 to 22,000 cfm — Buffalo Forge Co., P. O. Box 985, Buffalo 5. It describes fan assembly, motor base, filter section, humidifier, insulation, etc., and includes a psychrometric chart with explanation. All specifications and selection data are given.

Air Cooling Equipment For Supermarkets

HPAC 103—Folder outlines features of "Hastings" air conditioning equipment for cooling supermarkets — Air Control Inc., Brandeis Theater Bldg., Omaha 2.

Air Distributors

HPAC 104—Two technical data sheets give installation procedures and describe the special features of air distributors (standard and draftless types) for heating, ventilating, and cooling — Charles Demuth & Sons, Inc., 245 Elm Place, Mineola, L. I., N. Y.

Air Filters

HPAC 105—Composite catalog No. 510 gives engineering and technical data on a number of different types of air filters — American Air Filter Co., Inc., 373 Central Ave., Louisville 8. Covered are various types of electronic precipitators, automatic air filters (dry type), high velocity air filters, replaceable glass filament filters, permanent metal filter frames with replaceable media, etc. Installation and maintenance data are included.

Anemometer

HPAC 106—Data sheet (Catalog 102) gives characteristics and principles of operation of the "Air-Meter", a portable anemometer designed to give instantaneous direct readings of air velocities as low as 5 fpm and up to 6000 fpm — Hastings Instrument Co., Inc., P. O. Box 1275, Hampton, Va. A new price list is included on an attached sheet.

Air Conditioning Equipment by TYPHOON

FROM A 1½ TON CONSOLE UNIT TO A CENTRAL PLANT

Self-contained units 1½ to 20 tons
Multi-packaged systems to 60 tons
Evaporative condensers 3-20 tons
Room air conditioners ½-¾ ton
Central plants
Packaged water chillers
Air handling units
a) chilled water
b) direct expansion
Boilers
Coils
Heat pumps

New jobs, remodeling jobs — stores, supermarkets, offices, theatres — in fact, almost any job you undertake can be covered *best* with Typhoon *quality-engineered* equipment.

Typhoon works with you through its special Planning Service to design the most economical and efficient layout for every job, large or small. And through its system of Zone Control, Typhoon guarantees even distribution of cool air through the premises.

You will find as have top rated companies like RCA, ABC Television, and Whelan's Drug Stores that Typhoon's 40 years of experience pays big dividends in dependable performance, economical operation.

The Right Air Conditioning System for the Right Job

SPACE SAVING SINGLE UNITS — all Typhoon units are compact — a Typhoon 10-ton packaged unit takes up no more floor space than the average 5-ton unit.

MULTI-ZONE SYSTEMS — Planned and engineered so that they occupy no retail floor space at all.

CENTRAL PLANT SYSTEMS — Designed for maximum economy, minimum duct work.

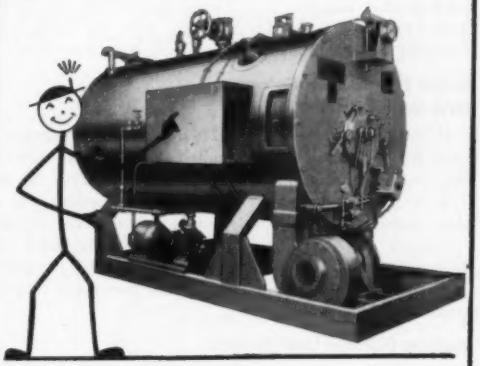
Write for detailed information Specialists in Air Conditioning Since 1909

TYPHOON AIR CONDITIONING COMPANY, Inc. 794 Union St., Brooklyn 15, N. Y.

ACCESSIBLE! THAT'S THE

AMESTEAM GENERATOR

FROM EVERY ANGLE



EYE-LEVEL CONTROLS . . .

Protected from Dirt, Water and Accidental Damage . . .

And Look at the Space Underneath Shell, too!

EVERYTHING'S Easy-To-Get-At!

Nineteen Sizes — 10 to 500 h.p.
15# to 200# w.p.
OIL or GAS

WRITE FOR BULLETIN 1011-C

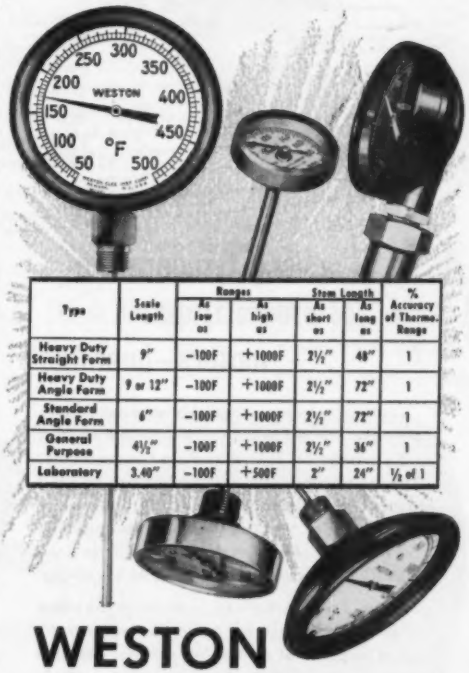
AMES IRON WORKS

BOX G-4 OSWEGO, N. Y.

Builders of Better Boilers Since 1848

Available

in broadest selection of types, ranges, stem lengths



Type	Scale Length	Ranges As low as	Ranges As high as	Stem Length As short as	Stem Length As long as	% Accuracy of Thermo. Range
Heavy Duty Straight Form	9"	−100F	+1000F	2½"	48"	1
Heavy Duty Angle Form	9 or 12"	−100F	+1000F	2½"	72"	1
Standard Angle Form	6"	−100F	+1000F	2½"	72"	1
General Purpose	4½"	−100F	+1000F	2½"	36"	1
Laboratory	3.40"	−100F	+500F	2"	24"	½ of 1

WESTON

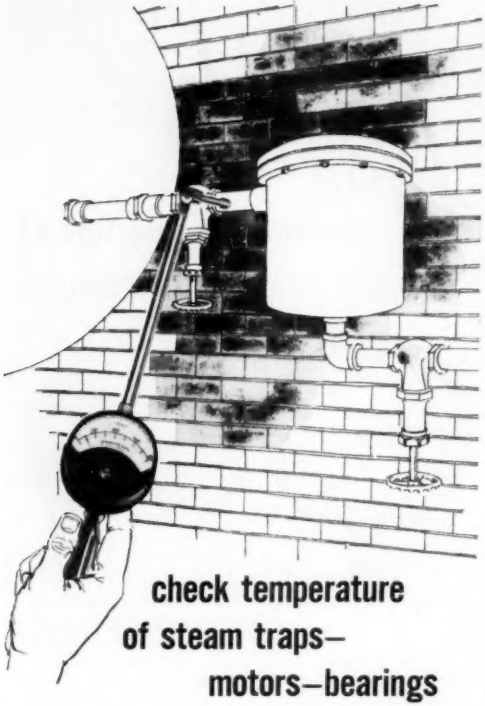
all-metal THERMOMETERS

WESTON Thermometers give you *all* the advantages of all-metal construction *to an unmatched degree.* The durability of stainless steel stems . . . the readability of large, boldly marked scales . . . the sustained accuracy due to precision manufacture *proved* through the years. Order through your regular jobber, or your local WESTON Representative. Catalog T-13 on request . . . WESTON Electrical Instrument Corporation, 617 Frelinghuysen Ave., Newark 5, New Jersey . . . *manufacturers of Weston and TAGliabue Instruments.*

WESTON

Temperature Instruments INDICATE — RECORD — CONTROL

V288



check temperature of steam traps— motors—bearings

. . . quickly and accurately with the Alnor Pyrocon, the portable contact pyrometer for taking surface temperatures. This handy, portable instrument can be your most useful maintenance and installation tool . . . it provides accurate temperature readings instantly of any surface (metallic or non-metallic), flat, curved, stationary or revolving.

It's a well-balanced instrument mounted in a sturdy case for protection against the usual hazards of on-the-job service. Jeweled movement is also heavy-duty, shock-resistant type that will withstand hard and continuous use . . . performing with laboratory accuracy.

A wide selection of thermocouples and extension arms assures its adaptation to your needs. Eight standard F. scale ranges are available up to 1200°F. Send for complete details contained in Bulletin 4257. Illinois Testing Laboratories, Inc., Rm. 513, 420 N. LaSalle St., Chicago 10, Ill.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Anti-Corrosion Protective Membrane

HPAC 107—Anti-corrosion protective membrane catalog covers rubber or plastic corrosion resistant linings for use with processing equipment in the chemical and allied industries, in pipe and fittings, ducts, pumps, impellers, and any other type of equipment subject to corrosive chemicals — Acme-Fisher Div., Broadway Rubber Corp., 529 E. Broadway, Louisville 2, Ky. Special sections are devoted to various types of applications. Selection tables are included.

Backfiller-Tamper-Side Crane

HPAC 108—Bulletin S120 (four pages) covers the Model 80 backfiller-tamper-side crane, a one man operated machine that backfills as it tamps and travels — Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17. Complete specifications and dimension data are given.

Cable For Pneumatic and Hydraulic Control Circuits

HPAC 109—Bulletin BA-927 describes "Armortube" cable for pneumatic and hydraulic control circuits, a flexible, protected, multi-tube transmission line made up of 1/4 in. OD aluminum or copper tubing gathered in a slow continuous spiral similar to the construction of rope — Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10. It is capable of transmitting hydraulic control pressures as high as 3000 psig and all ranges of pneumatic control pressures, the company states.

Ceiling Diffuser Unit Coolers

HPAC 110—Data sheet P-52 describes ceiling diffuser unit coolers which distribute the cold air across the ceiling, and prevent sweating of ceilings in cold storage rooms — Refrigeration Economics Co., Canton 2, Ohio. The diffusers can be used either as unit coolers or as air conditioning comfort coolers. Capacities and other specifications are given.

Cloth Type Dust Filter

HPAC 111—Bulletin 101 describes the operation and special features of the "Dynaclone" cloth type filter for collecting industrial dusts — The W. W. Sly Mfg. Co., 4700 Train Avenue, Cleveland 2. Principal features, according to the company, are uniformly maintained suction, and removal of dust from filter bags by reversing of air flow.

Coal Mine Maintenance Welding

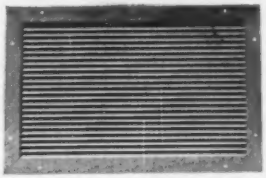
HPAC 112—Manual, *Coal Mine Maintenance Welding*, covers specialized welding applications, including such problems as heavy cast iron repairs, dragline shovel pinion repair, etc. — Eutectic Welding Alloys Corp., Dept. P., 40-40 172nd St., Flushing, New York 58. Included is a standardization chart listing over 50 different maintenance applications and the recommended welding alloys for their repair.

Combustion Control for Oil and Gas Fired Boilers

HPAC 113—Bulletin 1023 (24 pages) describes automatic air operated combustion control for oil and gas fired boilers — Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10. Diagrams show nine typical firing methods, and 16 major control equipment components. There is also installation information.

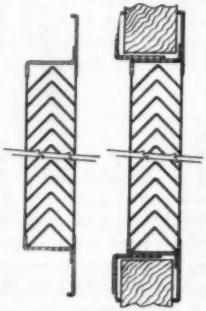
Save Dollars and Days

On Every Job... with "A-J"s!



NO-VISION DOOR AND PARTITION GRILLES

AUXILIARY FRAMES FOR *NEAT* — *FAST* — *EASY* INSTALLATION!



This exclusive feature can save you hours on every job! Ends tedious fitting. Special telescoping frame slides over core of grille. Automatically adjusts to fit any door thickness from 1⅜" to 2½". Gives same neat appearance on both sides.

These famous A-J Grilles are designed to save you time and money on every job. Series 700 (illustrated) Grilles are made entirely from steel. Special inverted "V" shaped louvers are securely set into end frames on ½" centers. Metal corners are re-inforced with a metal backing, and spot welded.

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GIVE VENTILATION PROBLEMS

THE AIR...

No doubt about it—Penn Dynafans increase employee efficiency in your customer's plants by exhausting the "hot spots." This rugged unit can be depended upon to handle the toughest ventilation problems . . .

- **Motors out of the air stream, safely remove dust, heat, fumes, vapors, etc.**
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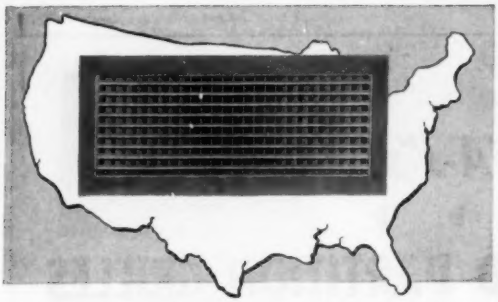

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Combustion Control System

HPAC 114—Bulletin R-8 describes the use of a combustion control system in a large electric power producing plant in Connecticut, listing the resulting economies, etc. — The Hays Corp., Michigan City, Ind. Use of steam, fuel and ash handling, and plant steam demand are discussed and illustrated. A large schematic drawing shows the operation of the control system, and a drawing of the instrument panel is tied into photographs of functions performed by particular controllers.

Composition Disc Valves

HPAC 115—Folder describes renewable composition disc bronze valves, illustrating the different valves assembled from the basic valve body and a few additional parts — The Fairbanks Co., 393 Lafayette St., New York 3. A bronze globe valve is used to illustrate the special features of the group. Various types of discs are described, and types of valves covered include globe and angle, lift checks, spring loaded check, and stop and check valves.

Convector Heating

HPAC 116—Catalog 594 describes six types of convectors which afford a method of concealed heating for stores, offices, schools, institutions, and homes — The National Radiator Co., 221 Central Ave., Johnstown, Pa. The 28 page booklet shows both frequent and infrequent piping connections, and gives roughing-in dimensions, and convector ratings for either steam or hot water use, which have been determined in conformance with Commercial Standard CS 140-47. Various types of heavy gage steel enclosures are described, and data is included on boiler pressure drop through convectors. Also given are a heat emission rate chart, and illustrations of typical installations.

Data on Electrical Equipment

HPAC 117—Data book B-2161-E (330 pages) contains information on electrical equipment in the three general categories of power plant, electrical distribution, and utilization and accessory equipment — Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh 30. This edition, containing a section on engineering data, has been revised to include information on new equipment and methods, and a section on power distribution. For a copy, contact the company's nearest district office.

Evaporative Condensers and Cooling Towers

HPAC 118—1952 catalog includes complete descriptions, dimensions and selection charts for new and expanded line of evaporative condensers and cooling towers — Baltimore Aircoil Co., Inc., 2615-35 Mathews Street, Baltimore 18.

Explosionproof Motors

HPAC 119—Bulletin 51B7286A gives construction details of explosionproof motors, both fan cooled and nonventilated types, in ratings of 3 to 100 hp and ½ to 2 hp, respectively — Allis-Chalmers Mfg. Co., 1176 S. 70th St., Milwaukee. They are approved by Underwriters' Laboratories, Inc., for use in Class I, Group D, and Class II, Groups F and G atmospheres.

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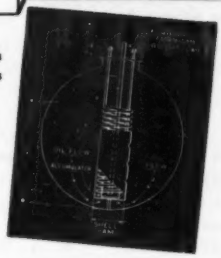
REMPE "Hot Spot" PREHEATER

Preheats fuel oils and other liquids to proper flow temperature before entering the suction line.



No. 5 and Bunker C oils flow more freely at high temperatures—have greater BTU value. The Rempe "Hot-Spot" does the preheating job efficiently. Takes the load off the suction pump. All-steel construction. Inlet and outlet pipes furnished in required lengths for any diameter tank. Steam or Hot Water can be used as heat source. Made with 14" or 16" diameter shell.

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AN ACCURATE ADAPTABLE THERMOSTAT

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The type E5 thermostat is a precision-built temperature control which can be fitted with a wide variety of thermal assemblies and switches to suit the particular application. Temperature limits -150° F to +600° F.

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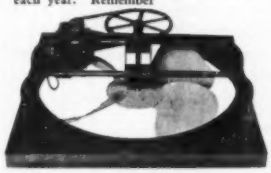

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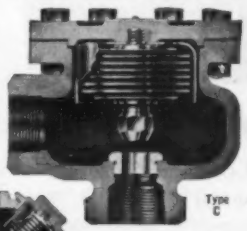

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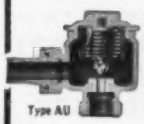

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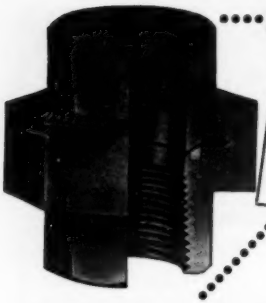

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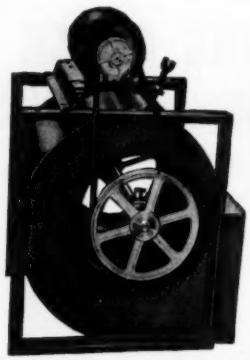


THE NEW UNIVERSAL TYPE "N" BLOWER

MASSACHUSETTS . .

By changing the position of the oil cup, the four popular discharges (lower horizontal, upper horizontal, down-blast and up-blast) can be obtained. Sizes 7 to 16½ inches wheel diameter.

WRITE FOR BULLETIN No. 110 CATALOG

MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
4901 HAMILTON AVENUE CLEVELAND 14, OHIO

Heating Plant

HPAC 120—Catalog 595 contains information on the design, construction and operation of an all-in-one heating plant, comprising boiler, burner, controls, domestic water heater and accessories—The National Radiator Co., 221 Central Ave., Johnstown, Pa. Component parts are illustrated and ratings and specifications for flush jacket and enclosing cabinet models are presented. Roughing-in dimensions are given.

Hot Water Boosters

HPAC 121—Four page folder describes electric hot water boosters used in connection with commercial dishwashing equipment—Waage Electric, Inc., Kenilworth, N.J.

Hot Water Heating Systems

HPAC 122—Manual FCE-1251 is a revised engineering and installation guide containing drawings, tables, wiring diagrams and examples of various types of hot water heating systems — H. A. Thrush & Co., Peru, Ind. A section is devoted to radiant heating, and the designing of one and two pipe forced circulating hot water heating installations is explained step by step.

Impulse Type Steam, Gas or Air Turbines

HPAC 123—Six new bulletins describe a line of impulse type steam, gas or air turbines for mechanical drive, the line having recently been expanded for general industrial use—The Pyle-National Co., 1334 N. Kostner Ave., Chicago 51. Bulletin 4110-B covers turbines of ¼ to 3½ brake hp; bulletin 4110-C, ½ to 14 brake hp; bulletin 4110-D, ½ to 20 brake hp; bulletin 4110-E, 1½ to 32 brake hp; bulletin 4110-F, 5 to 120 brake hp. Bulletin 4110-A provides general turbine information. Performance charts, construction details, dimensions, weights and selection data are given in each bulletin.

Line Type Purifiers

HPAC 124—Condensed Bulletin 500 covers "Hi-ef" line type purifiers, designed to remove 99 percent of entrained liquids, solids, etc., from live or exhaust steam—The V. D. Anderson Co., 1935 W. 96th St., Cleveland 2. Typical steam applications (steam ejectors, steam jacketed kettles, rotating steam drums) and air applications (air tools, inter-cooler for gas compressors, spray painting) are shown.

Low-Voltage Metal Enclosed Switchgear

HPAC 125—Booklet B-5282 describes "Unitized" low voltage metal enclosed switchgear, outlining applications, both indoor and outdoor—Westinghouse Electric Corp., Box 2099, Pittsburgh 30. Described are "De-Ion" air circuit breakers, which are the core of the switchgear. Current ratings, interrupting ratings, and inspection, disconnection, and replacement data are included.

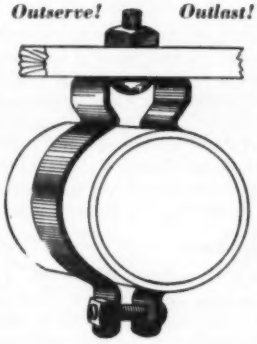
Lubricants For Metals

HPAC 126—Booklet describes "Moly-sulfide" lubricant, listing application in assembling machinery, in cold drawing, cold forming, disassembling, hot forming, metal cutting, etc.—Climax Molybdenum Co., 500 Fifth Ave., New York 18.

MINERALLAC

Steel HANGERS, CLIPS, STRAPS

Outserve! *Outlast!*



Minerallac Cable, Conduit and Messenger Hangers are STEEL. Easier, quicker to install; permit speedy, compact wiring; economical. Also in Everdur . . . Porcelain insulating Bushings available.

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Steel Straps for Messenger-cable services on outlet boxes; may be used in conjunction with hangers.

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HAJOCA offers ONE-STOP SERVICE

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DUCT AND FITTINGS

The Adelta line has been completely designed to provide maximum flexibility with fewer fittings. New designs incorporate exclusive time-saving features which reduce cutting, crimping, notching and drilling to a minimum.

All Adelta units delivered ready to assemble—no special sheet metal equipment needed. Call or write your nearest Hajoca Branch for your copy of Adelta Catalog No. 150.

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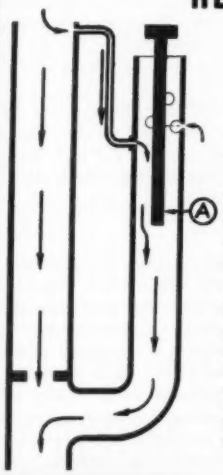
Compensated HEAT EXCHANGER Control



The Aerco Heat Exchanger has a control inside a tube which draws and mixes samples from various parts of the shell. Result: two degree maximum variation on intermittent loads or half a degree on continuous loads, up to 80% of the load. Even when oversized there is no over-ride.

Aerco may be used as a combination booster-control in series with storage heaters, or as a packaged hot water heater with capacities up to 300 g.p.m.

Technical Bulletin No. 22 describes the operating features, with tables for size determination, water capacities, and steam requirements.

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AERCO CORPORATION

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How to promote greater PER-MAN productivity!

Well-ventilated working environments contribute to faster, better defense production.

Western Rotary Turbine Ventilators provide constant, round-the-clock exhaust *without power*. A 2-mph breeze keeps your Western Rotary System in operation. Lifetime guaranteed bearings are both mounted on the same axis . . . always stay in alignment. Throat sizes 6" through 48", with the clean, low silhouette progressive industry demands.

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High Velocity Range: 750-5500 fpm
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Write for Bulletin AM-100

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Air Diffusers • Air Filters • Exhausters

Masonry Drill Bits

HPAC 127—Folder describes a rotary bit for precision drilling in hard concrete, a rotary bit for drilling in soft and medium hard masonry materials, and a hammer bit for drilling in hard and very hard masonry materials — New England Carbide Tool Co., Inc., 60 Brookline St., Cambridge 39, Mass.

Motors

HPAC 128—10 new data sheets cover construction features, specifications, dimensions and prices of fractional hp gear motors (parallel single reduction, parallel double reduction, right angle single reduction, right angle combination), and two new sheets give prices on constant speed and adjustable speed direct current motors (totally enclosed, unit cooled) — Century Electric Co., 1806 Pine St., St. Louis 3. The gear motor sheets are intended to replace the corresponding sheets issued in previous years.

Motors and Motor Applications

HPAC 129—Booklet B-4731 presents design and application features of "Life-Line" motors, now made in ratings up to 700 hp—Westinghouse Electric Corp., Box 2099, Pittsburgh 30. Applications in various industries are illustrated, and separate sections describe motor frames, end brackets, rotors, etc.

Negative Temperature Coefficient Resistance Units

HPAC 130—Bulletin 13 describes negative temperature coefficient resistance units, used to interrelate thermal and electrical behavior and translate one into the other—Keystone Carbon Co., St. Marys, Pa.

Oil Burners

HPAC 131—Catalog describes the complete line of "Hev-E-Oil" burners, which utilize heavier grades of fuel oil, up to No. 5, as well as light oils—Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee 12. It contains illustrations of the various sizes, and lists capacities.

Pyrometer

HPAC 132—Bulletin GEC-836 describes the new Type FH-1 hand pyrometer, with two scale ranges, for the rapid measurement of surface, liquid, gas and molten-metal temperatures—General Electric Co., Meter and Instrument Dept., Schenectady 5, N. Y.

Resistance Thermometers

HPAC 133—Catalog EN-S4 describes an entire line of general purpose and specialized "Thermohms" (resistance thermometers), including information on assemblies, parts, and accessories—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44. The instruments are designed to detect temperature between −325 and 1000 F, with accuracies of ± 0.018 F to ± 3.0 F. Included are a tabular guide indicating applications, and information about temperature conditions, corrosive agents, pressures, and other process conditions to which the elements can be exposed.

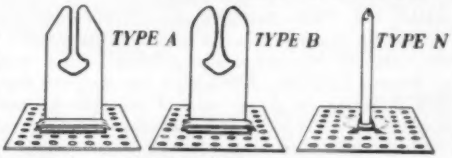
Rotary Pumps

HPAC 134—Bulletin L313B describes a new general service screw type rotary pump designed to handle petroleum products and other light viscous fluids as required for hydraulic systems, rotary and steam atomizing oil

Stic-Klips

Designed for

Insulation Installation



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Quick Setting Oil Resistant,
Heat Resistant, Water-proof
Fire Resistant, Terrific Bonding Strength.

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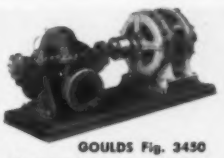
Keep costs DOWN... efficiency UP with this Single-Stage Centrifugal Pump



GOULDS Fig. 3450
Horizontally split and bolted glands provide easy access for repacking.

For: Circulating and Booster Service

If you are looking for economy plus efficiency, it will pay you to specify Goulds Fig. 3450 Single-Stage Centrifugal Pumps. These low-cost pumps offer high-efficiency service with relatively low power consumption. Their simple, sturdy construction assures long life and low maintenance. Capacities to 15,000 G.P.M. Heads to 500 ft. Write for Bulletins 721.1 and 721.2.

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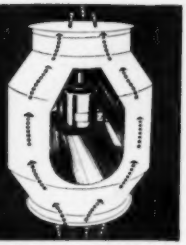

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The Industrial Air Duo Duct is specially designed to exhaust corrosive gases, fumes, smoke, and to induce draft on boilers. It has two exhaust ducts joined at both the suction and discharge ends. Both motor and bearing are mounted in the internal well, protected from the harmful corrosive effects of exhaust air, smoke or fumes. The internal well is open on two sides for proper and efficient cooling. The entire unit is designed for temperatures as high as 700° Fahrenheit and is available in diameters from 14" through 72", 1000 to 100,000 CFM.

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burners, lubrication, governing systems and similar services—De Laval Steam Turbine Co., Trenton 2, N. J. It lists capacities to 80 gpm, pressures to 275 psi (continuous) and to 325 psi (intermittent). Included are viscosity tables and dimensions for various frame sizes.

Safety Relief Devices

HPAC 135—Slide chart indicates proper selection of relief devices required in accordance with the ASAB9.1-1950 Code for Mechanical Refrigeration—Henry Valve Co., Melrose Park, Ill. One side of the computer determines discharge in lb per min of air and the number of relief devices required for all types of refrigerants in vessels of various sizes. The other side selects, in terms of code requirements, the proper size and type of the company's relief valves. Also furnished is a pocket folder for the selection of relief devices for mechanical refrigeration systems in accordance with the Chicago Municipal Code.

Small Tonnage Condensers

HPAC 136—Catalog 235 (four pages) covers small tonnage condensers which are designed as replacement units, and for moderately priced installations—Acme Industries Inc., Jackson, Mich. Described are shell and tube condensers (½ to 25 tons capacity) and shell and coil condensers (½ to 5 ton capacity).

Stud Driver

HPAC 137—Folder lists operating features, and shows applications of the Model 450 stud driver, a self-powered fastening tool—Remington Arms Co., Inc., Industrial Tool Div., Bridgeport 2, Conn.

Tubing Information Service

HPAC 138—Folder describes a tubing information bureau designed to aid in solving tubing problems (improving existing products, designing new products, and lowering production and material costs)—Nikoh Tube Co., 5000 South Whipple, Chicago 32. A weight table for the company's tubing is included.

Tubular Rheostats and Resistors

HPAC 139—Catalog 5 shows a complete line of standard tubular rheostats, potentiometers, and resistors from 220 to 1000 watts—Rex Rheostat Co., 3 Foxhurst Rd., P. O. Box 232, Baldwin, L.I., N. Y. Also described are various special types of rheostats.

Ventilation System for Schoolrooms

HPAC 140—Bulletin 3500 covers the "Draft Stop" system of heating and ventilating classrooms, which is designed to intercept the air cooled by the window before it can spill out into the classroom—Herman Nelson Div., American Air Filter Co., Inc., 1824 Third Ave., Moline, Ill. It describes method of operation, design and location of fan and motor assembly, heating elements, etc., and offers suggested specifications.

Water Tube Boilers, Bent Tube Type

HPAC 141—Catalog describes and illustrates methods of production, characteristics, and installations of various types of bent tube type water tube boilers—The Bigelow Co., 174 River St., New Haven 3, Conn. Design data is given for each of the units described.

HIGH CAPACITY
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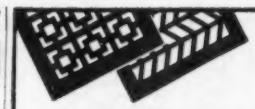
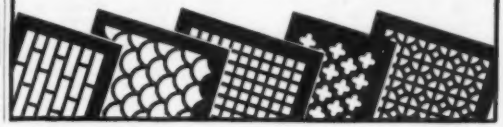


Auer
GRILLES

Many designs for all purposes—air conditioning, ventilating, radiator enclosure and concealment. Almost any sizes in steel, aluminum, brass or bronze. In selecting grilles, you will find Auer Grille Catalog "G" useful. It gives complete grille data, shows all Auer designs, with dimensions, opening sizes, and full scale details. Sent on request. Order Auer Grilles by name and number.

THE AUER REGISTER COMPANY
6400 Clement Avenue
Cleveland 3, Ohio



CLASSIFIED ADVERTISING

Classified Section: Rates for classified advertising are 12 cents for each word, including heading and address. One inch $6.00. Count nine words for keyed address. Minimum $2.00 for each insertion. Cash must accompany order.

situations open

Wanted: Two men with sales experience in heating, ventilating and air conditioning. Prefer graduate engineers although this is not an absolute requirement; experience can offset a degree. Should have experience calling on Architects and Engineers. One man will work the Chicago and surrounding territory. The other will work as Sales Promotion man and Technical Advisor contacting representatives throughout the country. Please write complete details of experience, education, personal data and salary expected. Address Key 934 A, Heating, Piping & Air Conditioning 6 No. Michigan Ave, Chicago 2, Ill.

SALES ENGINEERS, with experience in the sale of mechanical equipment, wanted for positions involving general application and sale of heating, ventilating, and air handling apparatus for commercial and industrial buildings, industrial processes, and mechanical draft. Positions are available at various locations. Personal interviews will be granted only after receipt of written application giving full details of experience. Address: Sturtevant Division, Westinghouse Electric Corporation, Dept AH, Hyde Park 36, Boston, Mass.

Director of Student Training: Large midwest manufacturer of air conditioning, heating and ventilating products is seeking a man to supervise training programs for engineering college graduates. Duties include: (1) curriculum planning, (2) instructing, and (3) group supervision. Man selected must have suitable engineering background since training emphasizes engineering rather than sales. Write Box 939A, Heating, Piping & Air Conditioning 6, No. Michigan Ave, Chicago 2, Ill.

Refrigeration Sales Engineer: Large midwest air conditioning manufacturer has excellent opening at home office for man with broad refrigeration engineering and sales background. Triple A company, nationally known with sales offices in all principal cities. Man selected must be qualified to help the field offices promote the sale of refrigeration compressors and to assist in closing large tonnage work. Write Key 940A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave, Chicago 2, Ill.

Permanent position in Consulting Engineers' Office in Baltimore, Maryland, for experienced designers of heating, plumbing and air conditioning systems for commercial and institutional buildings. State training, experience, availability and salary desired. Write Key 941 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

Fan Engineer experienced to take charge of engineering department and responsibility of conducting fan tests. Design experience helpful but not necessary. Location in Chicago with top salary, will pay moving expenses. Address Key 944 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

situations wanted

Engineer — M E degree 5 years experience in sales and engineering for manufacturer of heating and air conditioning equipment. Desires to relocate in East. Seeking permanent position with a progressive firm. Address Key 935A Heating, Piping & Air Conditioning, 6 No. Michigan Ave, Chicago 2, Ill.

Mechanical Engineer, age 30, married, B.S.M.E., 5 years experience in design and layout of heating, air conditioning, ventilating and plumbing. Desires position with engineer or contractor in Mexico. Address Key 936A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave, Chicago 2, Ill.

Mechanical Engineer: Anxious to locate in Southwest. Presently employed with consultant in charge of design and supervising installation of heating, ventilation, air conditioning and plumbing facilities in a large project. I enjoy this work and would like to continue in this field. I expect to exceed my present earning rate of $8,000. Will send resume on request. Address Key 938A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave, Chicago 2, Ill.

Graduate Mechanical Engineer with professional license, 6 years experience in the air conditioning field, including design, sales and installation, specialized in humidity control, presently design engineer for large mid-western consulting firm. Would like to relocate in coastal town. Present income $8000 per year. Address Key 945 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

situations open

Sales Manager wanted to coordinate present national low pressure steel boiler distribution through representatives and plumbing and heating jobbers. This traveling job requires active man with ability and experience in the heating industry. State experience, age and salary requested. Confidential. Address Key 945 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

for sale

3,000 ton REFRIGERATION PLANT. 2-York refrigerating units having a total capacity of 3,000 tons. Entire assembly consists of 2 compressors, 2 condensers, 2 water coolers, 2 motors, 2 speed increasers (2040 h.p. Westinghouse, 1200 to 3200 r.p.m.) and automatic control equipment. Address Key 946A, Heating, Piping & Air Conditioning, 6 No. Michigan Avenue, Chicago 2, Illinois.

for sale

1 — Buffalo Forge, Size 14, Duplex Conidal Fan 57,150 C.F.M. at 1½" Static Pressure.

1 — Induction Motor and Starter, 25 H.P. General Electric 3 Phase, 220/440 Volt, 1170 R.P.M.

Also large assortment 6", 8", 10", 12" Flanged Tees, Ells and Valves.

1 — Size 4-A 1200 lb. Hopper Iron Fireman with 5 H.P. 3 Phase, 220/440 Volt, 1725 R.P.M. Motor, 575 lb Coal per Hour.

All equipment in excellent operating condition, having just been replaced by similar units of greater capacity. Equipment location and sales point: Washington, D.C. Purchaser assumes responsibility for transportation costs and arrangements from this point.

Make reasonable cash offer.

Address Key 937A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave, Chicago 2, Ill.

FOR SALE — New 3 carrier 46R71 horizontal suspended type heat diffusing units. Each unit driven by 5 HP 55 V 3P 60 C motor, will handle 15000 CFM heated from 0 deg F to 78 deg F, final BTU content 1,112,000 BTU/hr. In original crates. Address Key 932A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave, Chicago 2, Ill.

agents wanted

Experienced Sales Representatives: Some territories available for nationally known and established line of Ventilating Fans, Blowers and Unit Heaters. Write—Massachusetts Blower Division, The Bishop & Babcock Mfg. Company, 4901 Hamilton Avenue N.E., Cleveland 14, Ohio.

lines wanted

Agent wishes additional Air Conditioning, heating and ventilating lines. Territories, Indiana, Eastern Illinois, Western Ohio and Northern Kentucky. Address Key 942 A Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

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A Clue to What You May Expect

from CLARAGE MULTITHERMS

LAND O'LAKES CREAMERY
MARSHFIELD, WISCONSIN

Land O'Lakes Creameries, Inc. — with general offices in Minneapolis and processing plants throughout Minnesota and Wisconsin — is the oldest and largest Cooperative Creamery Association in the United States. Land O'Lakes has used Clarage equipment for many years. Here, Mr. Glenn C. Kanten, manager of the Marshfield plant, gives you his opinion of Clarage Multitherms.

LAND O'LAKES
CREAMERIES INCORPORATED

LAND O' LAKES CRMY.
MARSHFIELD, WIS.

January 6, 1950

Clarage Fan Company
Kalamazoo, Michigan

Gentlemen:

We would like to report our experience with the five Clarage Multitherm air conditioning units installed here in our new plant in Marshfield during the spring of 1950.

We have found all five units entirely satisfactory. They far exceed our expectations. The air is properly conditioned summer and winter—even on the coldest days our walls are dry. This Clarage equipment maintains ideal conditions both for our processing and for the health and comfort of our employees.

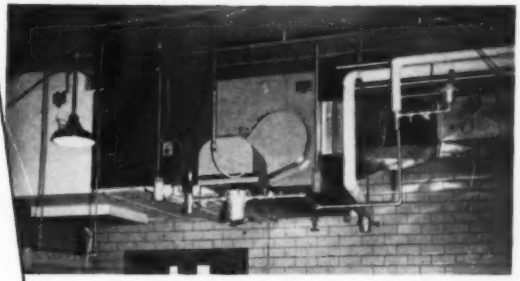
We do not hesitate to recommend Clarage Multitherm units for creamery air conditioning and similar types of process plants.

Yours truly,

Glen C. Kanten

Glen C. Kanten, Manager
Marshfield Branch Plant

Cc L. L. Cotton - LOL, Mpls.
Dick Condon



Five Multitherm Units comprise this air conditioning installation. They are installed at the ceiling level as shown above; need no valuable floor space. They provide heating in winter, cooling in summer, and dehumidification the year round. If you have almost any type of heating, cooling or complete air conditioning requirement, here are units worthy of your inquiry.

Incidentally, Clarage mechanical draft equipment is giving equally fine service in this plant.

WRITE FOR CATALOG 1307A

NEW MULTITHERM CATALOG contains many helpful suggestions for solving heating, cooling or complete air conditioning problems with guaranteed performance. Send for your copy today.

YOU CAN RELY ON

CLARAGE

HEADQUARTERS FOR AIR HANDLING & CONDITIONING EQUIPMENT

Clarage Fan Company 627 PORTER STREET **KALAMAZOO, MICH.**

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

Now McDONNELL Btu-rated relief valves for hot-water heating boilers... small and large

No. 33
SAFETY RELIEF VALVE
FOR HOT WATER BOILERS UP TO 242,900 BTU/HR OUTPUT

Opening pressure, 30 lbs. Discharge capacity covers most hot-water heating boilers.

No. 233
ASSEMBLY
FOR BOILERS UP TO 496,700 BTU/HR OUTPUT

Consists of two No. 33 Series valves mounted on manifold. First valve opens at 30 lbs.; second at 33 lbs.

No. 333 ASSEMBLY
FOR BOILERS UP TO 769,400 BTU/HR OUTPUT

Consists of three 33 Series valves mounted on manifold. First valve opens at 30 lbs; second at 33 lbs.; third at 36 lbs.

Authority speaks — Here is a straight forward statement from a recent bulletin issued by the highest authority on pressure vessel safety:

> "If a user wishes to protect a hot-water supply boiler or a hot-water heating boiler, the rules outlined in the 1949 A.S.M.E. Low-Pressure Heating Boiler Code and the 1950 Addenda thereto should be followed. In brief those rules require that all hot-water heating boilers and all hot-water supply boilers be equipped with *rated* relief valves. The relieving capacity of these rated relief valves should be equal to the heat output of the hot-water heating boiler or the hot-water supply boiler."

Every good heating man wants to conform to this regulation. As you no doubt know it was put into effect because the only sure way to protect a hot-water heating boiler from the disastrous overpressures produced by "runaway" firing is to provide a valve having a heat discharge capacity equal to the gross heat output of the boiler on which it is installed.

To conform with this ruling, it is only necessary to determine the heat output of the hot-water heating boiler; then equip it with a valve having equal or greater heat discharge capacity. This is easy when you equip it with a McDonnell 33 Series Safety Relief Valve. Each McDonnell Valve has its capacity in Btu. per hr. plainly shown on its name plate. The A.S.M.E. symbol is your proof that it has complied with all testing procedures outlined in the code.

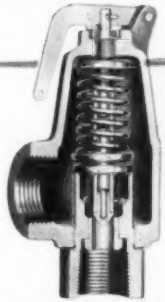
As shown above, a single No. 33 Valve has a discharge capacity sufficient for about 70% of all boilers. But there still remains the larger boilers that need protection equally, and for these we have developed the No. 233, two-valve and No. 333, three-valve assemblies illustrated above. Thus you can now have McDonnell protection for boilers of larger size.

The No. 233 and 333 assemblies consist of two or three Series 33 valves mounted on manifolds as shown. They are packaged completely assembled on the manifolds, ready for easy installation. Their opening pressures are set so that they open successively—first valve at 30 psi, second valve at 33 psi and third (if 333 assembly is used) at 36 psi. By this method it is possible to retain the basic advantage of 33 Series valves —low discharge rate with small orifice to take care of normal thermal expansion and high discharge rate to take care of a high temperature condition of overfiring. This is explained opposite. In contrast, if a single high capacity valve is utilized, the opening of a large orifice on thermal expansion will result in a needless large discharge rate that can easily be avoided by using a small easier-to-close orifice of the 33 design.

Complete details covering application and installation of No. 233 and 333 Assemblies are covered in a new bulletin. Basic facts are all given in the new McDonnell Condensed Catalog and Price List. Write.

McDONNELL & MILLER, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.

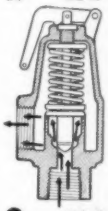
Doing One Thing Well



McDonnell 33 Series Safety Relief Valves are built to comply with the A.S.M.E. Boiler Code and have been tested and rated by the National Board of Boiler and Pressure Vessel Inspectors.

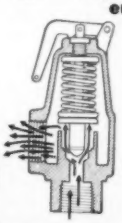
They have ideal operating characteristics:

1. Low discharge rate for normal operation



When boiler pressure reaches set opening pressure valve cone lifts just far enough to discharge water at low rate necessary to take care of thermal expansion. This advantage is retained whether one, two, or three valves are used.

2. High discharge rate for emergency operation



If for any reason steaming condition occurs, increased velocity acts on ingenious "Hydra-lift" disc, lifting valve wide open with snap action and discharging full rated capacity. Any emergency condition causes full opening whether one, two, or three valves are used.

Your Jobber Stocks Them

McDONNELL